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1      ; CP/M SYMBOLIC DEBUGGER MAIN MODULE
2      TITLE 'Symbolic Interactive Debugger (demon) 7/12/82'
3      ;
4      ; COPYRIGHT (C) 1976,1977,1982
5      ; DIGITAL RESEARCH
6      ; BOX 579 PACIFIC GROVE
7      ; CALIFORNIA 93950
8      ;
9      0000 = FALSE EQU 0
10     FFFF = TRUE EQU NOT FALSE
11     0000 = ISIS2 EQU FALSE ;TRUE IF RUNNING UNDER IS INTERFACE
12     0000 = DEBUG EQU FALSE ;TRUE IF DEBUGGING IN CP/M ENVIRONMENT
13     FFFF = RELOC EQU TRUE ;TRUE IF RELOCATION IMAGE
14     IF DEBUG
15     ORG 8000H ;BASE IF DEBUGGING
16     ELSE
17     IF ISIS2
18     ORG 0E500H
19     ELSE
20     IF RELOC ;BUILDING RELOCATION IMAGE
21     ORG 0000H ;BASE FOR RELOCATION
22     ELSE
23     ORG 0D000H ;TESTING IN 64 K
24     ENDIF
25     ENDIF
26     ENDIF
27     ;
28     ;
29     0000 = MODBAS EQU $ ;BASE OF ASSEM/DISASSEM/DEBUG
30     0000 DS 680H ;SPACE FOR DISASSEM/ASSEM MODULE
31     0680 = DEMON EQU $ ;BASE OF DEBUGGING MONITOR
32     0003 = DISIN EQU MODBAS+3
33     0005 = BDOS EQU 0005H ;PRIMARY BDOS ENTRY POINT
34     ;
35     IF ISIS2
36     BDOS EQU 103H ;REAL BDOS ENTRY
37     PCBASE EQU 3180H
38     SPBASE EQU 3180H
39     DSTART EQU 107H ;START OF DEBUGGER CODE
40     DBASE EQU DSTART+2 ;START OF LOADED PROGRAM
41     DNEXT EQU DBASE+2 ;NEXT FREE ADDRESS
42     BDBASE EQU 100H ;LOW BDOS LOCATION
43     BDTOP EQU 3180H ;HIGH BDOS LOCATION
44     ELSE
45     1806 = BDOS EQU MODBAS+1806H
46     1806 = BDBASE EQU BDOS ;BASE OF BDOS
47     2506 = BDTOP EQU BDBASE+0D00H ;TOP OF BDOS
48     0100 = PCBASE EQU 100H ;DEFAULT PC
49     0100 = SPBASE EQU 100H ;DEFAULT SP
50     ENDIF
51     ;
52     0006 = DISEN EQU DISIN+3 ;DISASSEMBLER ENTRY POINT
53     0009 = ASSEM EQU DISEN+3 ;ASSEMBLER ENTRY POINT
54     000C = DISPC EQU ASSEM+3 ;DISASSEMBLER PC VALUE
55     000E = DISPM EQU DISPC+2 ;DISASSEMBLER PC MAX VALUE
56     0010 = DISPG EQU DISPM+2 ;DISASSEMBLER PAGE MODE IF NON ZERO

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CP/M+ V 3.0

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57 000C =      PSIZE EQU      12      ;NUMBER OF ASSEMBLY LINES TO LIST WITH 'L'
58 0040 =      CSIZE EQU      64      ;COMMAND BUFFER SIZE
59 0032 =      SSIZE EQU      50      ;LOCAL STACK SIZE
60 0008 =      PBSIZE EQU      8       ;NUMBER OF PERMANENT BREAKS
61 0004 =      PBELT EQU      4       ;SIZE OF EACH PERM BREAK ELEMENT
62           ;
63           ;      BASIC DISK OPERATING SYSTEM CONSTANTS
64 0001 =      CIF EQU        1
65 0002 =      COF EQU        2
66 0003 =      RIF EQU        3
67 0004 =      POF EQU        4
68 0005 =      LOF EQU        5
69           ;
70 0007 =      IDS EQU        7
71 000A =      GETF EQU       10      ;FILL BUFFER FROM CONSOLE
72 000B =      CHKIO EQU      11      ;CHECK IO STATUS
73 000C =      LIFT EQU       12      ;LIFT HEAD ON DISK
74 000F =      OPF EQU       15      ;DISK FILE OPEN
75 0013 =      DELF EQU       19      ;DELETE FILE FUNC
76 0014 =      RDF EQU        20      ;READ DISK FILE
77 0015 =      WRITF EQU      21      ;SEQUENTIAL WRITE FUNC
78 001A =      DMAF EQU       26      ;SET DMA ADDRESS
79           ;
80 005B =      DBP EQU       5BH      ;DISK BUFFER POINTER
81 0080 =      DBF EQU       80H      ;DISK BUFFER ADDRESS
82 005C =      DFCB EQU       5CH      ;DISK FILE CONTROL BLOCK
83 005C =      FCB EQU       DFCB
84 0020 =      FCBL EQU       32      ;LENGTH OF FILE CONTROL BLOCK
85 006C =      FCB2 EQU      FCB+16   ;SECOND FILE CONTROL BLOCK
86 0000 =      FDN EQU        0       ;DISK NAME
87 0001 =      FFN EQU        1       ;FILE NAME
88 000B =      FFNL EQU       8       ;LENGTH OF FILE NAME
89 0009 =      FFT EQU        9       ;FILE TYPE
90 0003 =      FFTL EQU       3       ;LENGTH OF FILE TYPE
91 000C =      FRL EQU       12      ;REEL NUMBER
92 000F =      FRC EQU       15      ;RECORD COUNT
93 0020 =      FCR EQU       32      ;CURRENT RECORD
94 0021 =      FLN EQU      FCBL+1    ;FCB LENGTH INCLUDING CURRENT REC
95           ;
96 001A =      DEOF EQU       1AH      ;CONTROL-Z (EOF)
97 001A =      EOF EQU       DEOF     ;EOF=DEOF
98 0009 =      TAB EQU       09H      ;HORIZONTAL TAB
99 000D =      CR EQU        0DH
100 000A =      LF EQU        0AH
101           ;
102           IF      DEBUG
103      RSTNUM EQU      6      ;USE RESTART 6 FOR DEBUG MODE
104      ELSE
105 0007 =      RSTNUM EQU      7      ;RESTART NUMBER
106      ENDIF
107 0038 =      RSTLOC EQU      RSTNUM*8 ;RESTART LOCATION
108 00FF =      RSTIN EQU      0C7H OR (RSTNUM SHL 3) ;RESTART INSTRUCTION
109           ;
110           ;      TEMPLATE FOR PROGRAMMED BREAKPOINTS
111           ;
112           ;      PCH : PCL

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113      ;          HLH : HLL
114      ;          SPH : SPL
115      ;          RA : FLG
116      ;          B : C
117      ;          D : E
118      ;          -----
119      ;          FLG FIELD: HZOIOE1C (MINUS,ZERO,IDC,EVEN,CARRY)
120      ;
121 0005 = AVAL EQU 5      ;A REGISTER COUNT IN HEADER
122 0006 = BVAL EQU 6
123 0007 = DVAL EQU 7
124 0008 = HVAL EQU 8
125 0009 = SVAL EQU 9
126 000A = PVAL EQU 10
127      ;
128      ;
129      ;          DEMON ENTRY POINTS
130      ;          TPATOP:
131 0680 C3A06      JMP TRAPAD ;TRAP ADDRESS FOR RETURN IN CASE INTERRUPT
132 0683 C3AC6      JMP BEGIN
133      ;          BREAKA:
134 0686 C35916     JMP BREAKP
135      ;          USEFUL ENTRY POINTS FOR PROGRAMS RUNNING WITH DDT
136 0689 C34A11     JMP GETBUFF ;GET ANOTHER BUFFER FULL
137 068C C31512     JMP GNC      ;GET NEXT CHARACTER
138 068F C3C412     JMP PCHAR    ;PRINT A CHARACTER FROM A
139 0692 C3EA12     JMP PBYTE    ;PRINT BYTE IN REGISTER A
140 0695 C31313     JMP PADDSY    ;PRINT ADDRESS/SYMBOL REFERENCE
141 0698 C37E11     JMP SCANEXP   ;SCAN 0,1,2, OR 3 EXPRESSIONS
142 069B C38D13     JMP GETVAL    ;GET VALUE TO H,L
143 069E C30413     JMP BREAK     ;CHECK FOR CONSOLE READY
144 06A1 C33513     JMP PRLABEL   ;PRINT LABEL GIVEN BY HL, IF IT EXISTS
145      ;
146      ;
147      ;          TRAPAD:      ;GET THE RETURN ADDRESS FOR THIS JUMP TO BDOS IN CASE OF
148      ;          A SOFT INTERRUPT DURING BDOS PROCESSING.
149 06A4 E3          XTHL        ;PC TO HL
150 06A5 22F219      SHLD        RETLOC ;MAY NOT NEED IT
151 06A8 E3          XTHL
152      ;          TRAPJMP:
153      ;          ADDRESS FIELD OF THE FOLLOWING JUMP IS SET AT 'BEGIN'
154 06A9 C30000      JMP 0000H
155      ;
156      ;          BEGIN:
157      ;          SET THE BDOS ENTRY ADDRESS TO REFLECT THE REDUCED MEMORY
158      ;          SIZE, AS WELL AS TO TRAP THE CALLS ON THE BDOS. UPON
159      ;          ENTRY TO 'BEGIN' THE MEMORY ADDRESSES ARE SET AS FOLLOWS-
160      ;          BDOS: JMP BDOS
161      ;          MODBAS: JMP BEGIN
162      ;          DEMON: JMP TRAPAD
163      ;          TRAPAD: ...
164      ;          TRAPJMP:JMP XXXX
165      ;          BEGIN: ...
166      ;          BDOS: BDOS (OR NEXT MODULE)
167      ;
168      ;          CHANGE THE MEMORY MAP TO APPEAR AS FOLLOWS-

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159      ;      BDOSE: JMP      MODBAS
170      ;      MODBAS: JMP     TRAPAD
171      ;      DEMON:  JMP     TRAPAD
172      ;      TRAPAD: ...
173      ;      TRAPJMP:JMP     BDOS
174      ;      ...
175      ;      BDOS:  BDOS      (OR NEXT MODULE)
176      ;
177      ;      NOTE THAT WE DO NOT ASSUME THAT THE NEXT MODULE ABOVE
178      ;      THE DEBUGGER IS THE BDOS.  IN FACT, THE NEXT MODULE UP MAY
179      ;      BE ANOTHER COPY OF THE DEBUGGER ITSELF.
180      ;
181      06AC 2A0600      LHLD    BDOSE+1 ;ADDRESS OF NEXT MODULE IN MEMORY
182      06AF 22AA06      SHLD    TRAPJMP+1;CHANGE JUMP INSTRUCTION ADDRESS IN TRAP CODE
183      06B2 21A406      LXI     H,TRAPAD;ADDRESS OF TRAP CODE
184      06B5 220100      SHLD    MODBAS+1      ;CHANGE ADDRESS FIELD OF JUMP AT BEGINNING
185      06B8 210000      LXI     H,MODBAS      ;BASE OF DIS/ASSEMBLER CODE
186      06BB 220600      SHLD    BDOSE+1 ;CHANGE PRIMARY BDOS ENTRY ADDRESS
187      06BE 228119      SHLD    SYTOP      ;MARK SYMBOL TABLE EMPTY
188      ;
189      ;      NOTE THAT -A WILL CHANGE THE BDOSE JUMP ADDRESS TO
190      ;      THE BASE OF THE DEBUGGER MODULE ONLY, WHICH REMOVES THE
191      ;      DIS/ASSEMBLER FROM THE MEMORY IMAGE.
192      ;      'A-' IS IMPLIED IF THE LOAD ADDRESS EXCEEDS MODBAS.
193      ;
194      IF      ISIS2
195      POP     H          ;RECALL RETURN ADDRESS TO IS.COM
196      SHLD    DBASE      ;SET UP AS BASE OF PROGRAM
197      LXI     H,BEGINR;READ BEGINNING OF DDT
198      SHLD    DSTART;MARK AS DEBUG MODE
199      BEGINR:
200      ENDIF
201      06C1 AF          XRA     A          ;ZERO ACC
202      06C2 32F419      STA     BREAKS ;CLEARS BREAK POINT COUNT
203      06C5 328519      STA     DASH     ;00 IN DASH MARKS DIS/ASSEMBLER PRESENT
204      06C8 32CE19      STA     PBTRACE ;PERM BREAK TRACE SET FALSE
205      06CB 32A919      STA     TMODE     ;TRACE MODE CLEARED
206      ;
207
208      IF      ISIS2
209      LHLD    DBASE      ;BASE ADDRESS OF PROGRAM
210      ELSE
211      06CE 210001      LXI     H,PCBASE
212      ENDIF
213      06D1 220C00      SHLD    DISPC      ;INITIAL VALUE FOR DISASSEMBLER PC
214      06D4 226319      SHLD    DISLOC     ;INITIAL VALUE FOR DISPLAY
215      06D7 22761A      SHLD    PLOC      ;PC IN RESTART TEMPLATE
216      IF      ISIS2
217      LXI     H,PCBASE      ;PRIMARY ENTRY TO DDT, NO HIGH ADDR
218      ENDIF
219      06DA 228319      SHLD    MLOAD      ;MAX LOAD LOCAL
220      06DD 22A719      SHLD    DEFLOAD
221      06E0 210001      LXI     H,SPBASE
222      06E3 31741A      LXI     SP,STACK-4
223      06E6 E5          PUSH    H          ;INITIAL SP
224      06E7 210200      LXI     H,10B      ;INITIAL PSW

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225 06EA E5      PUSH    H
226 06EB 2B      DCX     H
227 06EC 2B      DCX     H      ;CLEARED
228 06ED 22741A  SHLD    HLOC   ;H,L CLEARED
229 06F0 E5      PUSH    H      ;B,C CLEARED
230 06F1 E5      PUSH    H      ;D,E CLEARED
231 06F2 22AA19  SHLD    USERBRK ;CLEAR USER BREAK DURING TRACE/UNTRACE
232              ;
233 06F5 3EC3      MVI     A,JMP   ;(JMP RESTART)
234 06F7 323800   STA     RSTLOC
235 06FA 218606   LXI     H,BREAKA      ;BREAK POINT SUBROUTINE
236 06FD 223900   SHLD    RSTLOC+1      ;RESTART LOCATION ADDRESS FIELD
237              ;
238              ;      CHECK FOR FILE NAME PASSED TO DEMON, AND LOAD IF PRESENT
239 0700 3A5D00   LDA     FCB+FFH ;BLANK IF NO NAME PASSED
240 0703 FE20     CPI     ' '
241 0705 CA2C07   JZ      START
242              ;
243              ;      USE A ZERO BIAS AND READ
244 0708 3A6500   LDA     FCB+9      ;IS COM SPECIFIED?
245 070B FE20     CPI     ' '      ;BLANK IF NOT
246 070D C22607   JNZ     DEFREAD   ;READ IT IN
247              ;
248 0710 CD9F10   CALL    COMDEF
249              ;
250 0713 3A6C00   LDA     FCB+010H      ;SYM FILE LOCATION
251 0716 FE20     CPI     ' '      ;IS IT THERE?
252 0718 CA2607   JZ      DEFREAD   ;JUMP OVER IF NO SYM FILE
253              ;
254 071B 3A7500   LDA     FCB+019H
255 071E FE20     CPI     ' '      ;IS THE TYPE SPECIFIED?
256 0720 C22607   JNZ     DEFREAD   ;BYPASS IF PRESENT
257              ;
258 0723 CDAE10   CALL    SYMDEF      ;INSERT .SYM FILE TYPE
259              ;
260              DEFREAD:
261 0726 210000   LXI     H,0
262 0729 C3490C   JMP     READN
263              ;
264              ;
265              ;      *****
266              ;      *
267              ;      *      MAIN COMMAND LOOP      *
268              ;      *
269              ;      *****
270              ;
271              START:
272 072C 316C1A   LXI     SP,STACK-12      ;INITIALIZE SP IN CASE OF ERROR
273 072F CD0413   CALL    BREAK      ;ANY ACTIVE CHARACTERS?
274 0732 0E01     MVI     C,CIF      ;CONSOLE INPUT FUNCTION
275 0734 C4A406   CNZ     TRAPAD      ;TO CLEAR THE CHARACTER
276 0737 CDFA12   CALL    CRLF      ;INITIAL CRLF
277              IF      DEBUG
278              MVI     A,'@'
279              ELSE
280 073A 3E23     MVI     A,'*'

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281      ENDIF
282 073C CDC412    CALL    PCHAR    ;OUTPUT PROMPT
283      ;
284      ;          GET INPUT BUFFER
285 073F CD4A11    CALL    GETBUFF ;FILL COMMAND BUFFER
286      ;
287 0742 CD1512    CALL    GNC      ;GET CHARACTER
288 0745 FE0D      CPI      CR
289 0747 CA2C07    JZ       START
290      ;          CHECK FOR NEGATED COMMAND
291 074A 21EF19    LXI      H,NEGCOM
292 074D 3600      MVI      M,0
293 074F FE2D      CPI      '-'    ;PRECEDING '-'?
294 0751 C25807    JNZ      POSCOM ;SKIP TO POSITIVE COMMAND IF NOT
295      ;          NEGATED COMMAND, MARK BY NEGCOM=TRUE
296 0754 35        DCR      M      ;00 BECOMES FF
297 0755 CD1512    CALL    GNC      ;TO READ THE COMMAND
298      POSCOM:
299 0758 D641      SUI      'A'    ;LEGAL CHARACTER?
300 075A DA9410    JC       CERROR ;COMMAND ERROR
301 075D FE1A      CPI      'Z'-'A'+1
302 075F D29410    JNC      CERROR
303      ;          CHARACTER IN REGISTER A IS COMMAND, MUST BE IN THE RANGE A-Z
304 0762 5F        MOV      E,A    ;INDEX TO E
305 0763 1600      MVI      D,0    ;DOUBLE PRECISION INDEX
306 0765 216F07    LXI      H,JMPTAB;BASE OF TABLE
307 0768 19        DAD      D
308 0769 19        DAD      D      ;INDEXED
309 076A 5E        MOV      E,M    ;LO BYTE
310 076B 23        INX      H
311 076C 56        MOV      D,M    ;HO BYTE
312 076D EB        XCHG      ;TO H,L
313 076E E9        PCHL      ;GONE...
314      ;
315      ;          JMPTAB:          ;JUMP TABLE TO SUBROUTINES
316 076F A307      DW      ASSM    ;A ENTER ASSEMBLER LANGUAGE
317 0771 9410      DW      CERROR  ;B
318 0773 CD07      DW      CALLPR  ;C CALL PROGRAM
319 0775 FD07      DW      DISPLAY ;D DISPLAY RAM MEMORY
320 0777 0709      DW      EXECUTE ;E
321 0779 2D09      DW      FILL    ;F FILL MEMORY
322 077B 4709      DW      GOTO    ;G GO TO MEMORY ADDRESS
323 077D 0B0A      DW      HEXARI  ;H HEXADECEMAL SUM AND DIFFERENCE
324 077F EFOA      DW      INFCB   ;I FILL INPUT FILE CONTROL BLOCK
325 0781 9410      DW      CERROR  ;J
326 0783 9410      DW      CERROR  ;K
327 0785 FCOA      DW      LASSM   ;L LIST ASSEMBLY LANGUAGE
328 0787 2B0B      DW      MOVE    ;M MOVE MEMORY
329 0789 9410      DW      CERROL   ;N
330 078B 9410      DW      CERROR  ;O
331 078D 510B      DW      PERMBRK ;P
332 078F 9410      DW      CERROR  ;Q
333 0791 130C      DW      READ    ;R READ HEXADECEMAL FILE
334 0793 310E      DW      SETHM   ;S SET MEMORY COMMAND
335 0795 C00E      DW      TRACE   ;T
336 0797 BB0E      DW      UNTRACE ;U

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337 0799 FC0E      DW      VALUE  ;V
338 079B FFOE      DW      WRITE  ;W
339 079D CF0F      DW      EXAMINE ;X EXAMINE AND MODIFY REGISTERS
340 079F 9410      DW      CERROR  ;Y
341 07A1 9410      DW      CERROR  ;Z
342                ;
343                ;
344                ;
345                ; *****
346                ; *                               *
347                ; *      A - ASSEMBLE      *
348                ; *                               *
349                ; *****
350                ;
351 ASSM:            ;ASSEMBLER LANGUAGE INPUT
352                ; CHECK FOR ASSM PRESENT
353 07A3 CDB312      CALL     CHKDIS ;GENERATE "NO CARRY" IF NOT THERE
354 07A6 D29410      JNC      CERROR ;NOT THERE
355 07A9 CD7E11      CALL     SCANEXP ;READ THE EXPRESSIONS
356 07AC B7          ORA      A      ;NONE GIVEN?
357 07AD C2BD07      JNZ      ASSM0  ;SKIP TO CHECK FOR SINGLE PARAMETER
358                ;
359                ; NO PARMS, MUST BE -A OR A COMMAND
360 07B0 3AEF19      LDA      NEGCON ;MUST BE SET
361 07B3 B7          ORA      A      ;FF?
362 07B4 CAC707      JZ       ASSM1  ;USE OLD DISPC FOR BASE
363 07B7 CD1611      CALL     NODIS  ;REMOVE DISASSEMBLER
364 07BA C32C07      JMP      START  ;FOR ANOTHER COMMAND
365                ;
366 ASSM0:           ;
367 07BD 3D          DCR      A      ;ONE EXPRESSION EXPECTED
368 07BE C29410      JNZ      CERROR
369 07C1 CD8D13      CALL     GETVAL ;GET EXPRESSION TO H,L
370 07C4 220C00      SHLD     DISPC
371 07C7 CD0900      ASSM1: CALL     ASSEM
372 07CA C32C07      JMP      START
373                ;
374                ;
375                ; *****
376                ; *                               *
377                ; *      C - CALL      *
378                ; *                               *
379                ; *****
380 CALLPR:          ;
381                ; CALL USER PROGRAM FROM DDT
382 07CD CD7E11      CALL     SCANEXP
383 07D0 DA9410      JC       CERROR ;CANNOT BE ,XXX
384 07D3 CA9410      JZ       CERROR ;CANNOT BE C ALONE
385 07D6 C89D13      CALL     GETVAL ;ADDRESS TO CALL IN H,L
386 07D9 E5          PUSH     H      ;READY FOR CALL
387                ; GET REMAINING PARAMETERS
388                ; REG-A CONTAINS 1,2,OR 3 CORRESPONDING TO NUMBER OF VALUES
389 07DA 010000      LXI      B,0
390 07DD 3D          DCR      A
391 07DE C2E607      JNZ      CALLO
392                ; NO PARAMETERS, STACK TWO ZEROES

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393 07E1 C5      PUSH    B
394 07E2 C5      PUSH    B
395 07E3 C3F607  JMP     CALL2
396             CALL0: ;AT LEAST ONE PARAMETER
397 07E6 CD8D13  CALL    GETVAL
398 07E9 E5      PUSH    H
399 07EA 3D      DCR     A
400 07EB C2F207  JNZ     CALL1
401             ;      ONLY ONE PARAMETER, STACK A ZERO
402 07EE C5      PUSH    B
403 07EF C3F607  JMP     CALL2
404             CALL1: ;MUST BE TWO PARAMETERS FOR THE CALL
405 07F2 CD8D13  CALL    GETVAL
406 07F5 E5      PUSH    H
407             CALL2: ;SET UP PARAMETERS IN B,C AND D,E
408 07F6 D1      POP     D      ;RECALL SECOND PARAMETER
409 07F7 C1      POP     B      ;RECALL FIRST PARAMETER
410             ;      READY FOR THE USER PROGRAM CALL
411 07F8 212C07  LXI     H,START ;RETURN ADDRESS
412 07FB E3      XTHL      ;CALL ADDRESS IN H,L RETURN IN STACK
413 07FC E9      PCHL      ;CALL USER
414             ;
415             ; *****
416             ; *
417             ; *      D - DISPLAY RAM      *
418             ; *
419             ; *****
420             ;
421             ;      DISPLAY MEMORY, FORMS ARE
422             ;      D      DISPLAY FROM CURRENT DISPLAY LINE
423             ;      DNNN   SET DISPLAY LINE AND ASSUME D
424             ;      DNN,MMM DISPLAY NNN TO MMM
425             ;      NEW DISPLAY LINE IS SET TO NEXT TO DISPLAY
426             ;      DISPLAY:
427 07FD CD6F11  CALL    SCANWORD
428 0800 CA1C08  JZ      DISP1      ;ASSUME CURRENT DISLOC
429 0803 CD8D13  CALL    GETVAL      ;GET VALUE TO H,L
430 0806 DA0C08  JC      DISPO      ;CARRY SET IF ,B FORM
431 0809 226319  SHLD   DISLOC      ;OTHERWISE DISPC ALREADY SET
432             ;      DISPO: ;GET NEXT VALUE
433 080C E67F  ANI     7FH      ;IN CASE ,B
434 080E 3D      DCR     A
435 080F CA1C08  JZ      DISP1      ;SET HALF PAGE MODE
436 0812 CD8D13  CALL    GETVAL
437 0815 3D      DCR     A      ;A,B,C NOT ALLOWED
438 0816 C29410  JNZ     CERROR
439 0819 C32908  JMP     DISP2      ;STORE IT
440             ;
441             ;
442             ;      DISP1:
443             ;      ;0 OR 1 EXPN, DISPLAY HALF SCREEN
444 081C 2A6319  LHLD   DISLOC
445 081F 11BF00  LXI     D,PSIZE*16-1
446 0822 19      DAD     D
447 0823 D22908  JNC     DISP2      ;THIS IS O.K.
448             ;

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449 0826 21FFFF LXI H,0FFFFH ;END OF RAM IN THIS CASE
450 DISP2:
451 0829 226619 SHLD DISMAX
452 ;
453 ; DISPLAY MEMORY FROM DISLOC TO DISMAX
454 DISP3:
455 ;
456 082C CD0413 CALL BREAK ;BREAK KEY?
457 082F C22C07 JNZ START ;STOP CURRENT EXPANSION
458 ;
459 ;
460 0832 2A6619 LHL DISMAX ;CHECK FOR THE END
461 0835 EB XCHG ;DE=DISMAX
462 0836 2A6319 LHL DISLOC ;HL=CURRENT LOCATION
463 0839 226819 SHLD TDISP
464 083C EB XCHG ;GET SET FOR CHECK
465 083D CD0C11 CALL HLDE ;ARE WE DONE?
466 ; JZ START ;YES
467 0840 DA2C07 JC START ;YES
468 ; NO WE HAVE MORE
469 0843 CDFA12 CALL CRLF ;NEXT LINE
470 0846 2A6319 LHL DISLOC ;
471 0849 CD4C13 CALL PADDR ;PRINT LINE ADDRESS
472 084C 3E3A MVI A,':'
473 084E CDC412 CALL PCHAR ;TO DELIMIT ADDRESS
474 0851 3AF019 LDA WDISP ;WORD DISPLAY?
475 0854 B7 ORA A
476 0855 CA9708 JZ DISP4 ;SKIP TO BYTE DISPLAY IF NOT
477 ;
478 0858 0E08 MVI C,8 ;DISPLAY 8 ITEMS PER LINE (DOUBLE BYTES)
479 ; FULL WORD DISPLAY, GET NEXT VALUE TO DE
480 085A CDC212 WORD0: CALL BLANK ;BLANK DELIMITER
481 085D 5E MOV E,H ;LOW BYTE
482 085E 23 INX H
483 085F 56 MOV D,H ;HIGH BYTE
484 0860 23 INX H ;READY FOR NEXT ADDRESS
485 0861 EB XCHG ;HL IS ADDRESS
486 0862 CD4C13 CALL PADDR ;PRINT THE ADDRESS VALUE
487 0865 CDC212 CALL BLANK
488 0868 EB XCHG ;BACK TO DE WITH THE ADDRESS VALUE
489 0869 0D DCR C ;
490 086A F5 PUSH A ;SAVE FLAGS
491 086B CD6313 CALL DISCOM
492 086E DA7808 JC WORD1
493 0871 F1 POP A ;RESTORE FLAGS
494 0872 C25A08 JNZ WORD0 ;FOR ANOTHER ITEM
495 0875 C3C808 JMP DISCH ;TO DISPLAY CHARACTERS
496 ;
497 WORD1:
498 0878 F1 POP A
499 WORD2:
500 0879 79 MOV A,C
501 087A B1 ORA C ;ARE WE AT THE END OF THE LINE?
502 087B CAC808 JZ DISCH ;YES, BRANC TO CHAR PRINT
503 ; NO, CONTINUE
504 087E CDC212CDC2 CALL BLANK ! CALL BLANK ! CALL BLANK

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505 0887 CDC212CDC2 CALL BLANK ! CALL BLANK ! CALL BLANK
506 0890 0D DCR C ;FINISHED THIS CHAR
507 0891 C27908 JNZ WORD2 ;WERE NOT DONE YET
508 0894 C3C808 JMP DISCH
509
510 DISP4:
511 0897 0E10 HVI C,16 ;COUNTER
512 DISP5:
513 0899 CDC212 CALL BLANK ;BLANK BYTE DELIMITER
514 089C 7E MOV A,H ;GET NEXT DATA BYTE
515 089D CDEA12 CALL PBYTE ;PRINT BYTE
516 08A0 0D DCR C ;DECREMENT COUNTER
517 08A1 F5 PUSH A ;SAVE IT
518 08A2 23 INX H
519 08A3 EB XCHG ;DE = CURRENT ADDRESS
520 08A4 2A6619 LHLD DISMAX ;HL = TOP OF RAM
521 08A7 CD0C11 CALL HLDE
522 08AA EB XCHG
523
524 ; JZ DISP6 ;END OF THE LINE PRINT BLANKS
525
526 08AB DAB508 JC DISP6 ;GO PRINT THE ENDING CHARACTERS
527 08AE F1 POP A ;RESTORE STATUS
528 08AF C29908 JNZ DISP5 ;PRINT NEXT BYTE
529 08B2 C3C808 JMP DISCH
530
531 DISP6:
532 08B5 F1 POP A
533 DISP7:
534 08B6 79 MOV A,C
535 08B7 B1 ORA C ;ARE WE AT THE END OF THE LINE? P. O. BOX 579
536 08B8 CAC808 JZ DISCH ;YES, BRANC TO CHAR PRINT
537 ;NO, CONTINUE
538 08BB CDC212 CALL BLANK
539 08BE CDC212 CALL BLANK
540 08C1 CDC212 CALL BLANK
541 08C4 0D DCR C ;FINISHED THIS CHAR
542 08C5 C2B608 JNZ DISP7 ;WERE NOT DONE YET
543 ;
544 ;
545 ;DISP7:
546 ; DCR C ;TO ADJUST THE PRINTER COUNT
547 ; MOV A,C
548 ; ORA C
549 ; JZ DISP7
550
551 ; CALL BLANK ;PRINT THE BLANK
552 ; MOV A,H ;PRINT THE LAST CHARACTER
553 ; CALL PBYTE ;
554 ; INX H ;ADJUST THE RAM POINTER
555 ; DCR C ;DECREMENT COUNTER
556 ; HVI A,TRUE
557 ; STA DISEND ;END FLAG
558 ;
559 ;
560 ;

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ARE WE AT THE END OF THE LINE? P. O. BOX 579
 YES, BRANC TO CHAR PRINT
 NO, CONTINUE

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561          DISCH: ;DISPLAY AREA IN CHARACTER FORM
562 00C8 226319    SHLD  DISLOC ;UPDATE FOR NEXT WRITE
563 08CB 3AEF19    LDA   NEGCOM ;NEGATED COMMAND?
564 08CE B7        ORA   A          ;FF IF NEGATED
565 08CF C22C08    JNZ   DISP3      ;TO SKIP THE CHARACTER DISPLAY
566 08D2 2A6819    LHL  TDISP
567 08D5 EB        XCHG
568 08D6 CDC212    CALL  BLANK
569 08D9 0E10      MVI   C,16      ;SET UP LOOP COUNTER
570          ;
571 08DB 1A        DISCH0: LDAX  D          ;GET BYTE
572 08DC CD5413    CALL  PGRAPH      ;PRINT IF GRAPHIC CHARACTER
573 08DF 13        INX   D
574 08E0 2A6619    LHL  DISMAX      ;COMPARE FOR END OF LINE
575 08E3 CD0C11    CALL  HLDE       ;HL=DISLOC
576 08E6 CAF308    JZ    DISP8      ;WE HAVE REACHED THE END
577 08E9 DA2C08    JC    DISP3
578 08EC 0D        DCR   C          ;16 CHARACTERS?
579 08ED C2DB08    JNZ   DISCH0     ;NO, DO IT AGAIN
580 08F0 C32C08    JMP   DISP3
581          ;
582          DISP8:
583 08F3 1A        LDAX  D          ;GET LAST CHARACTER
584 08F4 CD5413    CALL  PGRAPH      ;PRINT IT
585          ;
586 08F7 3A6519    LDA   DISEND
587 08FA FEFF      CPI   TRUE      ;
588 08FC C22C08    JNZ   DISP3      ;WE HAVE FINISHED
589 08FF 3E00      MVI   A,FALSE
590 0901 326519    STA   DISEND
591 0904 C32C07    JMP   START
592          ;
593          ;
594          ;
595          ;
596          ; *****
597          ; *
598          ; *      E - EXECUTE      *
599          ; *
600          ; *****
601          ;
602          EXECUTE:
603 0907 3A051A    LDA   CURLEN
604 090A B7        ORA   A
605 090B CA9410    JZ    CERR0R      ;
606          ;
607          EX1:
608 090E CD2511    CALL  FCBIN      ;READ IN THE FCBS
609          ; CHECK FOR DEFAULT
610 0911 3A6500    LDA   FCB+9
611 0914 FE20      CPI   ' '
612 0916 C21C09    JNZ   EX2
613 0919 CD9F10    CALL  COMDEF
614          EX2:
615 091C 3A7500    LDA   FCB+019H
616 091F FE20      CPI   ' '

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617 0921 C22709      JNZ     EX3
618 0924 CDAE10      CALL    SYMDEF
619
620 0927 210000      LXI     H,0          ;HL = BIAS FOR LOAD INTO PROGRAM
621 092A C3490C      JMP     READN       ;NOW READ IT IN
622
623
624
625
626
627
628
629
630
631 092D CD5911      CALL    SCAN3      ;EXPRESSIONS SCANNED BC , DE , HL
632 0930 7C          MOV     A,H        ;MUST BE ZERO
633 0931 B7          ORA     A
634 0932 C29410      JNZ     CERROR
635
636 0935 CDFD10      CALL    WRPCHK      ;CHECK FOR WRAP
637
638 0938 DA2C07      JC      START      ;BACK TO START
639 093B CDF810      CALL    BCDE       ;END OF FILL?
640 093E DA2C07      JC      START
641 0941 7D          MOV     A,L        ;DATA
642 0942 02          STAX    B          ;TO MEMORY
643 0943 03          INX     B          ;NEXT TO FILL
644 0944 C33509      JMP     FILL0
645
646
647
648
649
650
651
652
653 0947 AF          XRA     A          ;CLEAR AUTOU FLAG TO INDICATE GOTO
654 0948 326C19      STA     AUTOU      ;AUTOU=00 IF GOTO, FF IF TR/UNTR OR PERM BRK
655 094B CDAF12      CALL    CRLF       ;READY FOR GO.
656 094E CD7E11      CALL    SCANEXP    ;0,1, OR 2 EXPS
657 0951 326D19      STA     GOBRKS     ;SAVE GO COUNT
658 0954 CD8D13      CALL    GETVAL
659 0957 E5          PUSH    H          ;START ADDRESS
660 0958 CD8D13      CALL    GETVAL
661 095B 226E19      SHLD    GOBRK1     ;PRIMARY BREAK POINT
662 095E E5          PUSH    H          ;BKPT1
663 095F CD8D13      CALL    GETVAL
664 0962 227019      SHLD    GOBRK2     ;SECONDARY BREAK POINT
665 0965 44          MOV     B,H        ;BKPT2
666 0966 4D          MOV     C,L
667 0967 D1          POP     D          ;BKPT1
668 0968 E1          POP     H          ;GOTO ADDRESS
669 0969 C37309      JMP     GPR1       ;TO SKIP AUTOU=FF
670
671
672

```

EX3:

* F - FILL *

FILL:

FILL0:

* G - GOTO *

GOTO:

GPR1:

MARK AUTOU WITH FF TO INDICATE TRACE/UNTRACE OR PERM BREAK

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673 096C E5          PUSH    H          ;SAVE GO ADDRESS
674 096D 216C19       LXI     H,AUTOU    ;00 IF "GO" FF IF TR/UNTR/PERM BRK
675 0970 36FF        MVI     M,OFFH    ;MARK AS TR/UNTR/PERM BRK
676 0972 E1          POP     H          ;RECALL GO ADDRESS
677                  ;
678                  GOPR1: ;ARRIVE HERE FROM "GOTO" ABOVE WITH AUTOU=00
679 0973 F3          DI
680 0974 C8F09        JZ      GOP1      ;NO BREAK POINTS
681 0977 DA7D09       JC      GOP0
682                  ; SET PC
683 097A 22761A       SHLD    PLOC      ;INTO MACHINE STATE
684                  GOP0: ;SET BREAKS
685 097D E67F        ANI     7FH        ;CLEAR , BIT
686 097F 3D          DCR     A          ;IF 1 THEN SKIP (2,3 IF BREAKPOINTS)
687 0980 C8F09        JZ      GOP1
688 0983 CDE309       CALL    SETBK     ;BREAK POINT FROM D,E
689 0986 3D          DCR     A
690 0987 C8F09        JZ      GOP1
691                  ; SECOND BREAK POINT
692 098A 59          MOV     E,C
693 098B 50          MOV     D,B        ;TO D,E
694 098C CDE309       CALL    SETBK     ;SECOND BREAK POINT SET
695                  ;
696                  GOP1: ;NOW CHECK THE PERMANENT BREAK POINTS
697                  ; SCAN THE PERMANENT BREAK POINT TABLE, FORMS ARE
698                  ; COUNT LOW(ADDR) HIGH(ADDR) DATA
699 098F 21CF19       LXI     H,PBTABLE
700 0992 0E08        MVI     C,PBSIZE    ;NUMBER OF ELEMENTS
701                  SETPER0:
702 0994 E5          PUSH    H          ;SAVE NEXT TABLE ELT ADDRESS
703 0995 7E          MOV     A,M        ;LOW(COUNT)
704 0996 B7          ORA     A          ;00 IF NOT IN USE
705 0997 CAC909       JZ      SETPER2    ;SKIP IF NOT
706 099A 23          INX     H          ;TO LOW(ADDR)
707 099B 5E          MOV     E,M
708 099C 23          INX     H          ;TO HIGH(ADDR)
709 099D 56          MOV     D,M        ;DE IS THE BREAK ADDRESS
710 099E E5          PUSH    H          ;SAVE DATA ADDRESS-1
711                  ; MAY BE CONTINUE FROM CURRENT PERM BREAK ADDRESS
712                  ; OR A TRACE/UNTRACE MODE OPERATION
713 099F 3A6C19       LDA     AUTOU      ;00 IF NOT
714 09A2 B7          ORA     A          ;SET FLAGS
715 09A3 CAC209       JZ      SETPER1    ;SET THE BREAK POINT
716                  ; THIS IS A CONTINUATION FROM A PERM BREAK/OR A TRACE/UNTRACE
717 09A6 2A761A       LHLD    PLOC      ;AUTO "U" NECESSARY?
718 09A9 7B          MOV     A,E        ;LOW(ADDR)
719 09AA BD          CMP     L          ;=LOW(PLOC)?
720 09AB C2C209       JNZ     SETPER1    ;SKIP IF NOT
721 09AE 7A          MOV     A,D        ;HIGH(ADDR)
722 09AF BC          CMP     H          ;=HIGH(PLOC)?
723 09B0 C2C209       JNZ     SETPER1    ;SKIP IF ADDR <> PLOC
724                  ;
725                  ; ADDRESS MATCH, SET AUTO "U" COMMAND
726 09B3 E1          POP     H          ;RECALL DATA ADDRESS-1
727 09B4 E1          POP     H          ;RECALL TABLE ADDRESS
728 09B5 227219       SHLD    PBLOC     ;TABLE LOCATION FOR "U"

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729 0988 E5      PUSH    H          ;SAVE FOR NEXT ITERATION
730 09B9 7E      MOV     A,H        ;COUNT
731 09BA 3600     MVI     M,0        ;CLEARED IN MEMORY
732 09BC 327419   STA     PBCNT      ;MARKS AS AUTO U COMMAND NECESSARY
733 09BF C3C909   JMP     SETPER2    ;TO ITERATE
734              ;
735              SETPER1:
736              ;BREAK IS NOT AT CURRENT ADDRESS
737 09C2 E1      POP     H          ;RECALL DATA ADDRESS-1
738 09C3 23      INX     H          ;.DATA
739 09C4 1A      LLX     D          ;MEMORY DATA
740 09C5 77      MOV     M,A        ;SAVED IN THE TABLE
741 09C6 EB      XCHG          ;MEMORY ADDR TO HL
742 09C7 36FF     MVI     M,RSTIN    ;SET TO RESTART INSTRUCTION
743              SETPER2:
744 09C9 E1      POP     H          ;RECALL TABLE BASE
745 09CA 110400    LX      D,PBELT    ;ELEMENT SIZE
746 09CD 19      DAD     D          ;INCREMENTED TO NEXT ELEMENT
747 09CE 0D      DCR     C          ;END OF TABLE?
748 09CF C29409   JNZ     SETPER0    ;FOR ANOTHER ELEMENT
749              ;
750              GOP2: ;PERMANENT BREAK POINTS SET, NOW START THE PROGRAM
751 09D2 316C1A    LXI     SP,STACK-12
752 09D5 D1      POP     D
753 09D6 C1      POP     B
754 09D7 F1      POP     PSW
755 09D8 E1      POP     H          ;SP IN HL
756 09D9 F9      SPHL
757 09DA 2A761A    LHL     PLOC      ;PC IN HL
758 09DD E5      PUSH    H          ;INTO USER'S STACK
759 09DE 2A741A    LHL     HLOC      ;HL RESTORED
760 09E1 FB      EI
761 09E2 C9      RET
762              ;
763              SETBK: ;SET BREAK POINT AT LOCATION D,E
764 09E3 F5      PUSH    PSW
765 09E4 C5      PUSH    B
766 09E5 21F419   LXI     H,BREAKS      ;NUMBER OF BREAKS SET SO FAR
767 09EB 7E      MOV     A,H
768 09E9 34      INR     M          ;COUNT BREAKS UP
769 09EA B7      ORA     A          ;ONE SET ALREADY?
770 09EB CAFE09   JZ      SETBK0
771              ; ALREADY SET, MOVE PAST ADDR, DATA FIELDS
772 09EE 23      INX     H
773 09EF 7E      MOV     A,H          ;CHECK = ADDRESSES
774 09F0 23      INX     H
775 09F1 46      MOV     B,H          ;CHECK HO ADDRESS
776 09F2 23      INX     H
777              ; DON'T SET TWO BREAKPOINTS IF EQUAL
778 09F3 BB      CMP     E          ;LOW =?
779 09F4 C2FE09   JNZ     SETBK0
780 09F7 78      MOV     A,B
781 09FB BA      CMP     D          ;HIGH =?
782 09F9 C2FE09   JNZ     SETBK0
783              ; EQUAL ADDRESSES, REPLACE REAL DATA
784 09FC 7E      MOV     A,M          ;GET DATA BYTE

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785 09FD 12      STAX  D      ;PUT BACK INTO CODE
786 09FE 23      SETBK0: INX  H      ;ADDRESS FIELD
787 09FF 73      MOV   M,E      ;LSB
788 0A00 23      INX   H
789 0A01 72      MOV   M,D      ;MSB
790 0A02 23      INX   H      ;DATA FIELD
791 0A03 1A      LDAX  D      ;GET BYTE FROM PROGRAM
792 0A04 77      MOV   M,A      ;TO BREAKS VECTOR
793 0A05 3EFF     MVI   A,RSTIN ;RESTART INSTRUCTION
794 0A07 12      STAX  D      ;TO CODE
795 0A08 C1      POP   B
796 0A09 F1      POP   PSM
797 0A0A C9      RET
798              ;
799              ; *****
800              ; *
801              ; *      H - HEX ARITHMETIC      *
802              ; *
803              ; *****
804              ;
805              ;
806 0A0B CD7E11   CALL  SCANEXP
807 0A0E CABD0A   JZ    HEXLIST ;TO LIST THE SYMBOL TABLE
808 0A11 CD8D13   CALL  GETVAL ;READY THE FIRST VALUE
809 0A14 3D      DCR   A      ;1 BECOMES 0, 2 BECOMES 1
810 0A15 CA3B0A   JZ    HEXSYM  ;PRINT THE SYMBOL ONLY
811 0A18 3D      DCR   A      ;2 BECAME 1, NOW BECOMES 0
812 0A19 C29410   JNZ   CERROR
813              ; FIRST VALUE IS IN HL
814 0A1C E5      PUSH  H
815 0A1D CD8D13   CALL  GETVAL ;SECOND VALUE TO H,L
816 0A20 D1      POP   D      ;FIRST VALUE TO D,E
817 0A21 E5      PUSH  H      ;SAVE A COPY OF SECOND VALUE
818 0A22 CDF12    CALL  CRLF   ;NEW LINE
819 0A25 19      DAD   D      ;SUM IN H,L
820 0A26 CD4C13   CALL  PADDR
821 0A29 CDC212   CALL  BLANK
822 0A2C E1      POP   H      ;RESTORE SECOND VALUE
823 0A2D AF      XRA   A      ;CLEAR ACCUM FOR SUBTRACTION
824 0A2E 95      SUB   L
825 0A2F 6F      MOV   L,A      ;BACK TO L
826 0A30 3E00     MVI   A,0      ;CLEAR IT AGAIN
827 0A32 9C      SBB   H
828 0A33 67      MOV   H,A
829 0A34 19      DAD   D      ;DIFFERENCE IN HL
830 0A35 CD4C13   CALL  PADDR
831 0A3B C32C07   JMP    START
832              ;
833              ;
834              ;
835 0A3B EB      XCHG
836 0A3C CDF12    CALL  CRLF   ;NEW LINE FOR SYMBOL
837 0A3F D5      PUSH  D      ;SAVE DE (ADDRESS VALUE) FOR ASCII PRINTOUT
838 0A40 D5      PUSH  D      ;SAVE DE FOR THE DECIMAL PRINTOUT
839 0A41 CD1313   CALL  PADDSY
840              ; PRINT THE VALUE IN DECIMAL

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841 0A44 CDC212      CALL    BLANK
842 0A47 3E23        MVI     A,'#'
843 0A49 CDC412      CALL    PCHAR
844
845 0A4C 0685        MVI     B,1 SHL 7 OR 5 ;FIVE DIGITS, ZERO SUPPRESS ON
846 0A4E 217519      LXI     H,DTABLE ;DECIMAL VALUE TABLE
847
848 ; INITIAL/PARTIAL DIVIDEND IS STACKED AT THIS POINT
849 NXTDIG:          ;CONVERT FIRST/NEXT DIGIT IN DVALUE TABLE
850 0A51 5E          MOV     E,H ;LOW ORDER DIVISOR
851 0A52 23          INX     H ;TO NEXT VALUE
852 0A53 56          MOV     D,H ;HIGH ORDER DIVISOR
853 0A54 23          INX     H ;READY FOR NEXT DIGIT
854 0A55 E3          XTHL    ;DIVIDEND TO HL, DTABLE ADDR TO STACK
855 0A56 0E30        MVI     C,'0' ;COUNT C UP WHILE SUBTRACTING
856 0A58 7D          HDIG0: MOV    A,L ;LOW ORDER DIVIDEND
857 0A59 93          SUB     E ;LOW ORDER DIVIDEND
858 0A5A 6F          MOV     L,A ;PARTIAL DIFFERENCE
859 0A5B 7C          MOV     A,H ;HIGH ORDER DIVIDEND
860 0A5C 9A          SBB     D ;HIGH ORDER DIVISOR
861 0A5D 67          MOV     H,A ;HL = HL - DECADE
862 0A5E DA650A      JC      HDIG1 ;CARRY GEN'ED IF TOO MANY SUBTRACTS
863 0A61 0C          INR     C ;TO NEXT ASCII DIGIT
864 0A62 C3580A      JMP     HDIG0 ;FOR ANOTHER SUBTRACT
865
866 ;
867 HDIG1: ;COUNTED DOWN TOO MANY TIMES
868 DAD     D ;ADD DECADE BACK
869 MOV     A,B ;CHECK FOR ZERO SUPPRESS
870 ORA     A ;SIGN BIT SET?
871 JP      HDIG2 ;SKIP IF 0 BIT SET
872 PUSH    PSM ;SAVE THE ZERO SUPPRESS / COUNT
873 ; HIGH ORDER BIT SET, MUST BE ZERO SUPPRESSION
874 MOV     A,C ;CHECK FOR ASCII ZERO
875 CPI     '0'
876 JZ      HDIG3 ;SKIP PRINT IF ZERO
877 ; DIGIT IS NOT ZERO, CLEAR THE ZERO SUPPRESS FLAG
878 CALL    PCHAR
879 POP     PSM
880 ANI     7FH ;REMOVE SUPPRESS FLAG
881 MOV     B,A ;BACK TO B REGISTER
882 JMP     HDIG4 ;TO DECREMENT THE B REGISTER
883
884 HDIG2: ;ZERO SUPPRESSION NOT SET, PRINT THE DIGIT
885 MOV     A,C ;READY TO PRINT
886 CALL    PCHAR ;PRINTED TO CONSOLE
887 JMP     HDIG4 ;TO DECREMENT THE B REGISTER
888
889 HDIG3: ;CHARACTER IS ZERO, SUPPRESSION SET
890 ; MAY BE THE LAST DIGIT
891 POP     PSM ;RECALL DIGIT COUNT
892 ANI     7FH ;MASK LOW BITS
893 CPI     1 ;LAST DIGIT?
894 JNZ     HDIG4 ;TO DECREMENT THE B REGISTER
895 MOV     B,A ;CLEAR ZERO SUPPRESSION
896 JMP     HDIG2 ;TO PRINT THE CHARACTER
897
898 ;
899 HDIG4: ;DIGIT SUPPRESSED OR PRINTED, DECREMENT COUNT

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897 0A8F E3      XTHL      ;DTABLE ADDRESS TO HL, PARTIAL TO STACK
898 0A90 05      DCR      B      ;COUNT B DOWN
899 0A91 C2510A   JNZ      NXTDIG    ;FOR ANOTHER DIGIT
900              ;
901              ;      OPERATION COMPLETE, REMOVE PARTIAL RESULT
902 0A94 D1      POP      D      ;REMOVED
903 0A95 D1      POP      D      ;ORIGINAL VALUE TO DE
904              ;      PRINT THE CHARACTER IN ASCII IF GRAPHIC
905 0A96 7A      MOV      A,D      ;MUST BE ZERO
906 0A97 B7      ORA      A
907 0A98 C22C07   JNZ      START    ;SKIP THE TEST
908 0A9B 7B      MOV      A,E      ;CHARACTER GRAPHIC?
909 0A9C E67F     ANI      7FH      ;STRIP PARITY
910 0A9E FE20     CPI      ' '      ;BELOW SPACE?
911 0AA0 DA2C07   JC      START    ;SKIP IF SO
912 0AA3 3C      INR      A      ;7FH (RUBOUT) BECOMES 00
913 0AA4 CA2C07   JZ      START    ;SKIP IF SO
914 0AA7 CDC212   CALL     BLANK    ;BLANK BEFORE QUOTES
915 0AAA 3E27     MVI      A,'''    ;FIRST QUOTE
916 0AAC CDC412   CALL     PCHAR
917 0AAF 7B      MOV      A,E
918 0AB0 E67F     ANI      7FH      ;REMOVE PARITY (AGAIN)
919 0AB2 CDC412   CALL     PCHAR    ;CHARACTER
920 0AB5 3E27     MVI      A,'''
921 0AB7 CDC412   CALL     PCHAR
922 0ABA C32C07   JMP      START
923              ;
924              ;      HEXLIST:
925              ;      ;DUMP THE SYMBOL TABLE TO THE CONSOLE
926 0ABD 2A8119   LHL      SYTOP    ;TOPMOST ELEMENT
927 0AC0 23      INX      H      ;TO LOW ADDRESS
928 0AC1 23      INX      H      ;TO HIGH ADDRESS
929              ;      HEXLIS0:
930 0AC2 56      MOV      D,M      ;HIGH ADDRESS TO D
931 0AC3 2B      DCX      H      ;MOVE DOWN TO LOW
932 0AC4 5E      MOV      E,M      ;LOW ADDRESS TO E
933 0AC5 2B      DCX      H      ;MOVE DOWN TO LENGTH
934 0AC6 4E      MOV      C,M      ;LENGTH TO C
935 0AC7 2B      DCX      H      ;TO THE FIRST CHARACTER
936 0AC8 79      MOV      A,C      ;TO ACCUMULATOR FOR COMPARE
937 0AC9 FE10     CPI      16      ;STOP IF LENGTH > 16
938 0ACB D22C07   JNC      START    ;FOR THE NEXT INSTRUCTION
939              ;      OTHERWISE, PRINT THE SYMBOL
940 0ACE CDF412   CALL     CRLF      ;NEWLINE FOR SYMBOL
941 0AD1 EB      XCHG      ;SYMBOL ADDRESS TO HL
942 0AD2 CD4C13   CALL     PADDR     ;ADDRESS IS PRINTED
943 0AD5 EB      XCHG      ;HL IS THE FIRST SYMBOL
944 0AD6 CDC212   CALL     BLANK    ;TO PRINT A BLANK AFTER ADDRESS
945 0AD9 0C      INR      C      ;IN CASE C = 00
946              ;      HEXLIS1:
947 0ADA 0D      DCR      C      ;COUNT = COUNT - 1
948 0ADB CAE60A   JZ      HEXLIS2   ;SKIP TO END OF SYMBOL IF SO
949 0ADE 7E      MOV      A,M      ;CHARACTER IN A
950 0ADF 2B      DCX      H      ;TO NEXT SYMBOL TO GET
951 0AE0 CDC412   CALL     PCHAR    ;TO PRINT THE CHARACTER
952 0AE3 C3DA0A   JMP      HEXLIS1  ;FOR ANOTHER CHARACTER

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953          HEXLIS2:
954          ;END OF SYMBOL, CARRIAGE RETURN LINE FEED
955 0AE6 CD0413 CALL BREAK
956 0AE9 C22C07 JNZ START ;TO SKIP THE REMAINDER
957 0AEC C3C20A JMP HEXLIS0 ;FOR ANOTHER SYMBOL
958
959
960          ;
961          ; *****
962          ; * * *
963          ; * I - INPUT FCB *
964          ; * * *
965          ; *****
966          INFCB:
967 0AEF 3AEF19 LDA NEGCOM ;NEGATED?
968 0AF2 B7 ORA A
969 0AF3 C29410 JNZ CERROR ;COMMAND ERROR IF SO
970          ;
971 0AF6 CD2511 CALL FCBIN
972          ;
973
974 0AF9 C32C07 JMP START ;FOR ANOTHER COMMAND
975          ;
976          ; *****
977          ; * * *
978          ; * L - LIST MNEMONICS *
979          ; * * *
980          ; *****
981          ;
982          LASSM:
983          ; ASSEMBLER LANGUAGE OUTPUT LISTING
984          ; L<CR> LISTS FROM CURRENT DISASM PC FOR SEVERAL LINES
985          ; L<NUMBER><CR> LISTS FROM <NUMBER> FOR SEVERAL LINES
986          ; L<NUMBER>,<NUMBER> LISTS BETWEEN LOCATIONS
987 0AFC CDB312 CALL CHKDIS ;DISASM PRESENT?
988 0AFF D29410 JNC CERROR
989          ;
990 0B02 CD7E11 CALL SCANEXP ;SCAN EXPRESSIONS WHICH FOLLOW
991 0B05 CA200B JZ SPAGE ;BRANCH IF NO EXPRESSIONS
992 0B08 CDBD13 CALL GETVAL ;EXP1 TO H,L
993 0B0B 220C00 SHLD DISPC ;SETS BASE PC FOR LIST
994 0B0E 3D DCR A ;ONLY EXPRESSION?
995 0B0F CA200B JZ SPAGE ;SETS SINGLE PAGE MODE
996          ;
997          ; ANOTHER EXPRESSION FOLLOWS
998 0B12 CDBD13 CALL GETVAL
999 0B15 220E00 SHLD DISPM ;SETS MAX VALUE
1000 0B18 3D DCR A
1001 0B19 C29410 JNZ CERROR ;ERROR IF MORE EXPN'S
1002 0B1C AF XRA A ;CLEAR PAGE MODE
1003 0B1D C3220B JMP SPAGO
1004          ;
1005 0B20 3E0C SPAGE: MVI A,PSIZE ;SCREEN SIZE FOR LIST
1006 0B22 321000 SPAGO: STA DISPG
1007 0B25 CD0600 CALL DISEN ;CALL DISASSEMBLER
1008 0B28 C32C07 JMP START ;FOR ANOTHER COMMAND

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1009      ;
1010
1011      ;
1012      ; *****
1013      ; *
1014      ; *      M - MOVE MEMORY      *
1015      ; *
1016      ; *****
1017      ;
1018      MOVE:
1019      0B2B CD5911      CALL      SCAN3      ;BC,DE,HL
1020      MOVE0: ;HAS B,C PASSED D,E?
1021      0B2E CDF810      CALL      BCDE
1022      0B31 DA2C07      JC      START      ;END OF MOVE
1023      ; CHECK FOR WRAP AROUND
1024      0B34 C5          PUSH      B          ;SAVE STATE
1025      0B35 D5          PUSH      D
1026      0B36 E5          PUSH      H
1027      0B37 21FFFF      LXI      H,0FFFFH
1028      0B3A 7C          MOV      A,H          ;GET HIGH ORDER
1029      0B3B B8          CMP      B          ;ARE THEY THE SAME?
1030      0B3C C2470B      JNZ      MOVE1      ;B < H SO KEEP MOVIN....
1031      ;
1032      0B3F 7D          MOV      A,L          ;B = H SO CHECK LOW ORDER
1033      0B40 B9          CMP      C          ;SET FLAGS
1034      0B41 C2470B      JNZ      MOVE1
1035      ;
1036      0B44 C32C07      JMP      START      ;THEY ARE EQUAL,BC = FFFFH DO NOT WRAP
1037      MOVE1:
1038      0B47 E1          POP      H
1039      0B48 D1          POP      D
1040      0B49 C1          POP      B          ;RESTORE REGISTERS
1041      ; ELSE CONTINUE
1042      0B4A 0A          LDAX      B          ;CHAR TO ACCUM
1043      0B4B 03          INX      B          ;NEXT TO GET
1044      0B4C 77          MOV      M,A          ;MOVE IT TO MEMORY
1045      0B4D 23          INX      H
1046      0B4E C32E0B      JMP      MOVE0      ;FOR ANOTHER
1047      ;
1048
1049      ;
1050      ; *****
1051      ; *
1052      ; *      P - PERMANENT BREAK      *
1053      ; *
1054      ; *****
1055      PERMBRK:
1056
1057      0B51 CD7E11      CALL      SCANEXP ;0,1, OR 2 VALUES
1058      0B54 DA9410      JC      CERROR      ;P, NOT ALLOWED
1059      0B57 CADD0B      JZ      PERMZER ;NO EXPRESSIONS
1060      ; 1 OR 2 EXPRESSIONS FOUND
1061      0B5A CD8D13      CALL      GETVAL ;FIRST VALUE TO HL (BP NAME)
1062      0B5D E5          PUSH      H          ;SAVED TO STACK
1063      0B5E 210100      LXI      H,1          ;SET TO ONE BREAK IF NOT THERE
1064      0B61 3D          DCR      A          ;ITEM COUNT

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1065 0B62 3AEF19    LDA    NEGCOM ;READY NEGATED COMMAND FLAG
1066 0B65 CA720B    JZ     SETPVAL ;SKIP IF 1 EXPRESSION
1067 0B68 B7        ORA     A ;NEGATED IF FF
1068 0B69 C29410    JNZ    CERROR ;COMMAND ERROR IF FORM IS -PX,Y
1069 0B6C CD8D13    CALL   GETVAL ;MAY BE ZERO, USUALLY PASS COUNT
1070 0B6F C37C0B    JMP     SETPVAL0
1071
1072                SETPVAL:
                        ;ONLY ONE EXPRESSION, MAY BE NEGATED
1073 0B72 210000    LXI     H,0
1074 0B75 B7        ORA     A ;NEGATED IF FF
1075 0B76 C27C0B    JNZ    SETPVAL0;TO STORE THE 00
1076 0B79 210100    LXI     H,1 ;OTHERWISE THE PASS COUNT IS 1
1077
1078 0B7C 7C        MOV     A,H ;HIGH BYTE MUST BE ZERO
1079 0B7D B7        ORA     A ;00?
1080 0B7E C29410    JNZ    CERROR ;COMMAND ERROR IF NOT
1081
1082 0B81 227F19    SHLD    BIAS ;HELD IN BIAS
1083 0B84 21CF19    LXI     H,PBTABLE;SEARCH FOR THE STACKED ADDRESS
1084 0B87 0E0B      MVI     C,PBSIZE
1085 0B89 E5        PERM0: PUSH H ;SAVE CURRENT ELEMENT
1086 0B8A 7E        MOV     A,M ;IS COUNT=00?
1087 0B8B B7        ORA     A ;SET FLAGS
1088 0B8C CAA90B    JZ     PERM2
1089
1090 0B8F 23        ; COUNT IS NON-ZERO, MAY BE CURRENT ADDRESS
1091 0B90 7E        INX     H ;LOW(ADDR)
1092 0B91 23        MOV     A,M
1093 0B92 56        INX     H
1094 0B93 E1        MOV     D,M ;DA IS TABLE ADDRESS TO COMPARE
1095 0B94 E3        POP     H ;TABLE ELEMENT BASE TO HL
1096 0B95 BD        XTHL    ;STACKED SEARCH ADDRESS TO HL
1097 0B96 C2A70B    CNP     L ;LOW(ADDR) = LOW(SEARCH)?
1098 0B99 7A        JNZ    PERM1 ;SKIP IF NOT
1099 0B9A BC        MOV     A,D
1100 0B9B C2A70B    CNP     H ;HIGH(ADDR) = HIGH(SEARCH)?
1101 0B9C 7A        JNZ    PERM1 ;SKIP IF ADDR <> SEARCH
1102
1103 0B9E 3A7F19    ;
1104 0BA1 E1        ; FOUND THE ADDRESS TO OPERATE UPON
1105 0BA2 77        LDA     BIAS ;NEW COUNT
1106 0BA3 B7        POP     H ;TABLE ELEMENT BASE TO HL
1107 0BA4 C32C07    MOV     M,A ;SET TO MEMORY, MAY BE ZERO
1108
1109 0BA7 E3        ORA     A
1110 0BA8 E5        JMP     START ;GET NEXT COMMAND
1111 0BA9 E1        ;
1112 0BAA 110400    PERM1: XTHL    ;SEARCH ADDRESS BACK TO STACK
1113 0BAD 19        PUSH    H ;TABLE ADDRESS BACK TO STACK
1114 0BAE 0D        PERM2: POP     H ;TABLE ADDRESS REVIVED
1115 0BAF C2890B    LXI     D,PBELL ;ELEMENT SIZE
1116
1117 0BB2 3A7F19    DAD     D ;HL IS NEXT TO SCAN
1118 0BB5 B7        DCR     C ;COUNT DOWN TABLE LENGTH
1119 0BB6 CA9410    JNZ    PERM0 ;FOR ANOTHER TRY
1120
1121 0BB8 3A7F19    ;
1122 0BB9 B7        ; ARRIVE HERE IF ITEM CANNOT BE FOUND, MUST BE SETTING BREAK
1123 0BBB CA9410    LDA     BIAS ;=00?
1124 0BBD B7        ORA     A ;SET FLAGS
1125 0BBE 7A        JZ     CERROR ;ERROR IF NOT FOUND

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1121      ;      SEARCH ADDRESS IS STILL STACKED
1122      ;
1123      ;      SETTING NON ZERO PERMANENT PASS COUNT, FIND FREE ENTRY
1124      OBB9 21CF19      LXI      H,PBTABLE
1125      OBB9 0E08        MVI      C,PBSize
1126      OBBE E5          LPERMO:   PUSH     H      ;SAVE CURRENT TABLE BASE
1127      OBBF 7E          MOV      A,M      ;GET LOW(COUNT)
1128      OBC0 B7          ORA      A      ;COUNT=00?
1129      OBC1 C2D10B      JNZ      LPERM1  ;SKIP IF IN USE
1130      ;      FREE LOCATION, USE IT
1131      OBC4 3A7F19      LDA      BIAS     ;COUNT IN REG-A
1132      OBC7 E1          POP      H      ;TABLE BASE TO HL
1133      OBC8 77          MOV      M,A      ;NON ZERO COUNT SET
1134      OBC9 D1          POP      D      ;SEARCH ADDRESS
1135      OBCA 23          INX      H
1136      OBCE B7          MOV      M,E      ;SET LOW SEARCH
1137      OBCC 23          INX      H
1138      OBCE 72          MOV      M,D      ;SET HIGH SEARCH ADDRESS
1139      OBCE C32C07      JMP      START   ;FOR ANOTHER COMMAND
1140      ;
1141      OBD1 E1          LPERM1:   POP      H      ;RECALL TABLE BASE
1142      OBD2 110400      LXI      D,PBELL
1143      OBD5 19          DAD      D      ;HL IS NEXT TO SCAN
1144      OBD6 0D          DCR      C      ;COUNT TABLE SIZE DOWN
1145      OBD7 C2BE0B      JNZ      LPERMO
1146      ;
1147      ;      NO TABLE SPACE AVAILABLE
1148      OBDA C39410      JMP      CERROR
1149      ;
1150      ;
1151      PERNZER:
1152      ;NO EXPRESSIONS ENCOUNTERED, MUST BE DISPLAY OR CLEAR
1153      OBDD 21CF19      LXI      H,PBTABLE      ;SEARCH FOR DISPLAY OR RESET
1154      OBE0 0E08        MVI      C,PBSize
1155      OBE2 E5          PERNZO:   PUSH     H      ;SAVE NEXT TABLE ELEMENT ADDR
1156      OBE3 7E          MOV      A,M      ;COUNT TO A
1157      OBE4 B7          ORA      A      ;SKIP IF ZERO COUNT
1158      OBE5 CA070C      JZ      PERNZ2      ;SKIP IF INACTIVE
1159      ;      DISPLAY OR CLEAR
1160      OBE8 3AEF19      LDA      NEGCOM      ;-P?
1161      OBE8 B7          ORA      A
1162      OBEC CAF40B      JZ      PERNZ1
1163      ;
1164      ;      THIS IS A CLEAR, SO COUNT = 00
1165      OBEF 3600        MVI      M,0      ;CLEAR COUNT
1166      OBF1 C3070C      JMP      PERNZ2      ;TO GO TO NEXT ITEM
1167      ;
1168      PERNZ1:          ;THIS IS A DISPLAY
1169      OBF4 C5          PUSH     B      ;SAVE PBTABLE COUNT (C)
1170      OBF5 CDF12       CALL     CRLF     ;NEW LINE
1171      OBF8 7E          MOV      A,M      ;RECALL COUNT TO REGISTER A
1172      OBF9 CDEA12      CALL     PBYTE     ;PRINT BYTE
1173      OBF9 CDC212      CALL     BLANK     ;BLANK DELIMITER
1174      OBF9 23          INX      H      ;LOW OF ADDRESS
1175      OC00 5E          MOV      E,M
1176      OC01 23          INX      H

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1177 0C02 56      MOV    D,M          ;DE IS ADDRESS OF BREAK POINT
1178 0C03 CD1313  CALL    PADDSY      ;PRINT SYMBOL REFERENCE
1179 0C06 C1      POP     B          ;RECALL PBTABLE COUNT IN C
1180 0C07 E1      PERMZ2: POP     H          ;RECALL TABLE BASE
1181 0C08 110400   LXI     D,PBELT    ;ELEMENT SIZE
1182 0C0B 19      DAD     D          ;TO HL
1183 0C0C 0D      DCR     C          ;COUNT TABLE DOWN
1184 0C0D C2E208  JNZ     PERNZO      ;FOR ANOTHER
1185 0C10 C32C07  JMP     START      ;FOR A COMMAND
1186             ;
1187             ; *****
1188             ; * *
1189             ; *   R - READ   *
1190             ; * *
1191             ; *****
1192             ; READ:
1193 0C13 3A051A   LDA     CURLEN
1194 0C16 B7      ORA     A
1195 0C17 CA9410  JZ      CERROR      ;NO FILE AFTER READ COMMAND
1196             ;
1197 0C1A 215C00   LXI     H,DFCB      ;HL = DEFAULT FCB
1198 0C1D CDD111  CALL    GETFILE      ;GET FILENAME
1199 0C20 3600     MVI     H,00
1200 0C22 23      INX     H          ;BUMP FCB POINTER
1201 0C23 3E20     MVI     A,020H    ;BLANK IN ACC
1202 0C25 0E08     MVI     C,11      ;COUNTER FOR FILE BLANK
1203             ;
1204 0C27 77      MOV     M,A          ;BLANK AT MEM
1205 0C28 23      INX     H
1206 0C29 0D      DCR     C          ;
1207 0C2A C2270C  JNZ     R1          ;BACK IF MORE
1208 0C2D 3E00     MVI     A,00
1209 0C2F 0E04     MVI     C,4
1210 0C31 77      MOV     M,A          ;ZERO OUT REST OF FCB
1211 0C32 23      INX     H
1212 0C33 0D      DCR     C
1213 0C34 C2310C  JNZ     R2
1214 0C37 3600     MVI     M,0
1215             ;
1216 0C39 CD7E11  CALL    SCANEXP      ;CHECK FOR OFFSET EXPRESSION
1217 0C3C 210000   LXI     H,0        ;HL = INITIAL BIAS OFFSET
1218 0C3F CA490C  JZ      READN      ;IF NONE TO READN
1219 0C42 3D      DCR     A          ;ONE EXPRESSION?
1220 0C43 C29410  JNZ     CERROR
1221 0C46 2AFC19  LHLD    EXPLST+1    ;HL = NEW BIAS VALUE
1222             ;
1223             ; READN:
1224             ; HL HOLDS BIAS VALUE FOR LOAD OPERATION
1225 0C49 227F19  SHLD    BIAS
1226             ; COPY THE SECOND HALF OF THE FILE CONTROL BLOCK TO TEMP
1227 0C4C 216C00   LXI     H,FCB2
1228 0C4F 11361A   LXI     D,TFCB
1229 0C52 0E10     MVI     C,FCBL/2    ;HALF OF THE FCB SIZE
1230 0C54 7E      READO: MOV     A,M
1231 0C55 12      STAX    D          ;STORE TO TEMP POSITION
1232 0C56 23      INX     H

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1233 0C57 13      INX      D
1234 0C58 0D      DCR      C      ;COUNT TO END OF FCB
1235 0C59 C2540C  JNZ      READ0
1236              ;      SECOND HALF NOW SAVED, LOOK AT FIRST NAME
1237 0C5C 3A5D00  LDA      FCB+1  ;* SPECIFIED?
1238 0C5F FE3F    CPI      '?'
1239 0C61 CA320D  JZ       CHECKSY ;SKIP LOAD IF SO
1240 0C64 CD3712  RINIT: CALL   OPN      ;OPEN INPUT FILE
1241 0C67 FEFF    CPI      255
1242 0C69 CA9410  JZ       CERROR
1243              ;      CONTINUE IF FILE OPEN WENT OK
1244              ;      DISK FILE OPENED AND INITIALIZED
1245              ;      CHECK FOR 'HEX' FILE AND LOAD TIL EOF
1246              ;
1247 0C6C 210001  LXI      H,PCBASE
1248 0C6F 22A719  SHLD     DEFLOAD
1249 0C72 3E48    MVI      A,'H'  ;HEX FILE?
1250 0C74 015845  LXI      B,'XE'  ;REMAINDER OF NAME TO BC
1251 0C77 CD8612  CALL     QTYPE   ;LOOK FOR 'HEX'
1252 0C7A 2A7F19  LHLD     BIAS    ;RECALL BIAS VALUE
1253 0C7D E5      PUSH     H      ;SAVE TO MEM FOR LOADER
1254 0C7E CABE0C  JZ       HREAD
1255              ;
1256              ;      COM/UTL FILE, LOAD WITH OFFSET GIVEN BY 'BIAS'
1257 0C81 E1      POP      H      ;RECALL BIAS
1258 0C82 110001  LXI      D,PCBASE ;BASE OF TRANSIENT AREA
1259 0C85 19      DAD      D
1260              ;      REG H HOLDS LOAD ADDRESS
1261              LCOM0: ;LOAD COM FILE
1262 0C86 E5      PUSH     H      ;SAVE DMA ADDRESS
1263 0C87 115C00  LXI      D,DFCB
1264 0C8A 0E14    MVI      C,RDF  ;READ SECTOR
1265 0C8C CDA406  CALL     TRAPAD
1266 0C8F E1      POP      H
1267 0C90 B7      ORA      A      ;SET FLAGS TO CHECK RETURN CODE
1268 0C91 C2320D  JNZ      CHECKSY
1269              ;      MOVE FROM 80H TO LOAD ADDRESS IN H,L
1270 0C94 118000  LXI      D,80H
1271 0C97 0E80    MVI      C,80H  ;BUFFER SIZE
1272 0C99 1A      LCOM1: LDAX     D      ;LOAD NEXT BYTE
1273 0C9A 13      INX      D
1274 0C9B 77      MOV      M,A    ;STORE NEXT BYTE
1275 0C9C 23      INX      H
1276 0C9D 0D      DCR      C
1277 0C9E C2990C  JNZ      LCOM1
1278              ;      LOADED, CHECK ADDRESS AGAINST MLOAD
1279 0CA1 CD9D12  CALL     CKMLOAD
1280 0CA4 CDA512  CALL     CKDFLD
1281 0CA7 EB      XCHG                     ;HL & DE CORRECT
1282 0CAB 2A0600  LHLD     BD0SE+1 ;HL = TOP OF MEMORY
1283 0CAB CD0C11  CALL     HLDE    ;IS DMA ADDRESS > BASE OF SID?
1284 0CAE EB      XCHG
1285 0CAF D2860C  JNC      LCOM0    ;IF SO THEN ERROR.
1286 0CB2 210001  LXI      H,PCBASE
1287 0CB5 22A719  SHLD     DEFLOAD
1288 0CB8 228319  SHLD     MLOAD

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1289 0CBB C39410      JMP      CERROR
1290                  ;
1291                  ;
1292                  ;      OTHERWISE ASSUME HEX FILE IS BEING LOADED
1293 0CBE CD5C10      HREAD: CALL  DISKR  ;NEXT CHAR TO ACCUM
1294 0CC1 FE1A        CPI      DEOF   ;PAST END OF TAPE?
1295 0CC3 CA9410      JZ       CERROR ;FOR ANOTHER COMMAND
1296 0CC6 DE3A        SBI      ''
1297 0CC8 C2BE0C      JNZ      HREAD  ;LOOKING FOR START OF RECORD
1298                  ;
1299                  ;      START FOUND, CLEAR CHECKSUM
1300 0CCB 57          MOV      D,A
1301 0CCC E1          POP      H
1302 0CCD E5          PUSH     H
1303 0CCE CD240D      CALL     RBYTE
1304 0CD1 5F          MOV      E,A     ;SAVE LENGTH
1305 0CD2 CD240D      CALL     RBYTE  ;HIGH ORDER ADDR
1306 0CD5 F5          PUSH     PSW
1307 0CD6 CD240D      CALL     RBYTE  ;LOW ORDER ADDR
1308 0CD9 C1          POP      B
1309 0CDA 4F          MOV      C,A
1310 0CDB 09          DAD      B       ;BIASED ADDR IN H
1311 0CDC 7B          MOV      A,E     ;CHECK FOR LAST RECORD
1312 0CDD B7          ORA      A
1313 0CDE C2F10C      JNZ      RDTYPE
1314                  ;      END OF TAPE, SET LOAD ADDRESS
1315 0CE1 78          MOV      A,B
1316 0CE2 B1          ORA      C       ;LOAD ADDRESS = 00?
1317 0CE3 210001      LXI      H,PCBASE;DEFAULT = PCBASE IF 0000
1318 0CE6 CAE0C      JZ       SETPC
1319                  ;      OTHERWISE, PC AT END OF TAPE NON ZERO
1320 0CE9 69          MOV      L,C     ;LOW BYTE
1321 0CEA 60          MOV      H,B     ;HIGH BYTE
1322 0CEB 22761A      SETPC: SHLD  PLOC  ;SET PC VALUE
1323 0CEE C3320D      JMP      CHECKSY ;FOR SYMBOL COMMAND
1324                  ;
1325                  ;      RDTYPE:
1326 0CF1 CD240D      CALL     RBYTE  ;RECORD TYPE = 0
1327                  ;
1328                  ;      LOAD RECORD
1329 0CF4 CD240D      RED1: CALL  RBYTE
1330 0CF7 77          MOV      M,A
1331 0CF8 23          INX      H
1332 0CF9 1D          DCR      E
1333 0CFA C2F40C      JNZ      RED1   ;FOR ANOTHER BYTE
1334                  ;      OTHERWISE AT END OF RECORD - CHECKSUM
1335 0CFD CD240D      CALL     RBYTE
1336 0D00 F5          PUSH     PSW     ;FOR CHECKSUM CHECK
1337 0D01 CD9D12      CALL     CKMLOAD ;CHECK AGAINST NLOAD
1338 0D04 CDA512      CALL     CKDFLD
1339 0D07 F1          POP      PSW
1340 0D08 C29410      JNZ      CERROR  ;CHECKSUM ERROR
1341 0D0B C3BE0C      JMP      HREAD  ;FOR ANOTHER RECORD
1342                  ;
1343                  ;      RDHEX: ;READ ONE HEX BYTE WITHOUT ACCUMULATING CHECKSUM
1344 0D0E CD5C10      CALL     DISKR  ;GET ONE CHARACTER

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1345 0D11 CD8013 RDHEX0: CALL HEXCON ;CONVERT TO HEX
1346 0D14 07 RLC
1347 0D15 07 RLC
1348 0D16 07 RLC
1349 0D17 07 RLC ;MOVED TO HIGH ORDER NIBBLE
1350 0D18 E6F0 ANI OFOH ;MASKED LOW ORDER TO 0000
1351 0D1A F5 PUSH PSW ;AND STACKED
1352 0D1B CD5C10 CALL DISKR ;GET SECOND CHARACTER
1353 0D1E CD8013 CALL HEXCON ;CONVERTED TO HEX IN ACCUM
1354 0D21 C1 POP B ;OLD ACCUM TO REGISTER B
1355 0D22 80 ORA B ;AND'ED INTO RESULT
1356 0D23 C9 RET
1357 ;
1358 RBYTE: ;READ ONE BYTE FROM BUFF AT WBP TO REG-A
1359 ; COMPUTE CHECKSUM IN REG-D
1360 0D24 C5 PUSH B
1361 0D25 E5 PUSH H
1362 0D26 D5 PUSH D
1363 ;
1364 0D27 CD0E0D CALL RDHEX ;READ ONE HEX VALUE
1365 0D2A 47 MOV B,A ;VALUE IS NOW IN B TEMPORARILY
1366 0D2B D1 POP D ;CHECKSUM
1367 0D2C 82 ADD D ;ACCUMULATING
1368 0D2D 57 MOV D,A ;BACK TO CS
1369 ; ZERO FLAG REMAINS SET
1370 0D2E 78 MOV A,B ;BRING BYTE BACK TO ACCUMULATOR
1371 0D2F E1 POP H
1372 0D30 C1 POP B ;BACK TO INITIAL STATE WITH ACCUM SET
1373 0D31 C9 RET
1374 ;
1375 CHECKSY:
1376 ; CHECK FOR DIS/ASSEM OVERLOAD
1377 0D32 210000 LXI H,MODBAS
1378 0D35 CD9312 CALL COMLOAD ;HL > HLOAD? CARRY IF SO
1379 0D38 DA420D JC CHKSYM ;NO DIS/ASSEM OVERLAY
1380 0D3B 3A8519 LDA DASH ;00 IF PRESENT
1381 0D3E B7 ORA A
1382 0D3F CC1611 CZ NODIS ;REMOVE IF NOT ALREADY
1383 ;
1384 CHKSYM: ;CHECK FOR SYMBOL TABLE FILE
1385 ; FIRST SAVE UTL CONDITION, IF PRESENT
1386 0D42 3E55 MVI A,'U' ;FIRST CHARACTER OF UTL
1387 0D44 014C54 LXI B,'LT' ;REMAINDER OF NAME
1388 0D47 CD8612 CALL QTYPE ;FIND THE FILE TYPE - MAY BE UTL
1389 0D4A F5 PUSH PSW ;SAVE CONDITION FOR BELOW
1390 0D4B 21361A LXI H,TFEB ;NAME HELD HERE
1391 0D4E 115C00 LXI D,FCB ;SOURCE FILE CONTROL BLOCK
1392 0D51 0E10 MVI C,FCBL/2
1393 0D53 7E CHKSYO: MOV A,M ;GET CHARACTER
1394 0D54 12 STAX D ;SAVE INTO FCB
1395 0D55 23 INX H
1396 0D56 13 INX D ;POINTERS TO NEXT CHARS
1397 0D57 0D DCR C
1398 0D58 C2530D JNZ CHKSYO
1399 ;
1400 ; FCB FILLED WITH SECOND FILE NAME, CLEAR CR FIELD

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1401 0D5B AF      XRA    A
1402 0D5C 327C00 STA    FCB+FCR
1403 0D5F 3A5D00 LDA    FCB+1
1404 0D62 FE20    CPI    ' '
1405 0D64 CAF00D JZ     PRSTAT ;SKIP IF NO FILE NAME
1406              ;
1407              ; SYMBOL LOAD FOLLOWS
1408 0D67 218619 LXI    H,SYMSG ;WRITE 'SYMBOLS'
1409 0D6A CDD112 CALL   PRMSG      ;PRINT THE MESSAGE
1410              ; BIAS VALUE IS STORED IN 'BIAS'
1411 0D6D CD3712 CALL   OPN        ;OPEN THE SYMBOL FILE
1412 0D70 3C       INR    A      ;255 BECOMES 00
1413 0D71 CA9410 JZ     CERROR ;CANNOT OPEN?
1414              ; FILE OPENED, LOAD SYMBOL TABLE FROM FILE
1415              ;
1416              ; SYMBOL TABLE LOAD ROUTINE - LOAD ELEMENTS OF THE
1417              ; FORM -
1418              ; (CR/LF/TAB)HHHH(SPACE)AAAAA(TAB/CR)
1419              ; WHERE HHHH IS THE HEX ADDRESS, AAAAA IS A LIST OF
1420              ; CHARACTERS OF LENGTH <16. ADD BIAS ADDRESS TO EACH LOC'N
1421              ;
1422 0D74 CD5C10 LOADSY: CALL   DISKR ;GET NEXT STARTING CHARACTER
1423              LOADSY0:
1424 0D77 FE1A      CPI    EOF
1425 0D79 CAF00D JZ     PRSTAT ;COMPLETES THE LOAD
1426 0D7C FE21     CPI    ' '+1 ;GRAPHIC?
1427 0D7E DA740D JC     LOADSY ;UNTIL GRAPHIC FOUND
1428              ;
1429              ; GET THE SYMBOL ADDRESS TO HL
1430 0D81 CD110D CALL   RDHEX0 ;PRE-READ FIRST CHARACTER
1431 0D84 F5       PUSH   PSW ;HIGH ORDER BYTE SAVED
1432 0D85 CD0E0D CALL   RDHEX ;SECOND HALF
1433 0D88 D1       POP    D ;HIGH ORDER BYTE GOES TO D
1434 0D89 5F       MOV    E,A ;LOW ORDER BYTE TO E
1435 0D8A 2A7F19 LHLD   BIAS ;BIAS VALUE IN R COMMAND
1436 0D8D 19       DAD    D ;HL IS OFFSET ADDRESS
1437 0D8E E5       PUSH   H ;SAVE THE ADDRESS FOR LATER
1438 0D8F CD5C10 CALL   DISKR ;GET THE BLANK CHAR
1439 0D92 FE20     CPI    ' '
1440 0D94 CAA30D JZ     OKLOAD ;OK TO LOAD SYMBOL IF BLANK
1441              ;
1442              ; CLEAR TO THE NEXT NON GRAPHIC CHARACTER
1443 0D97 E1       POP    H ;THROW OUT THE LOAD ADDRESS
1444              SKLOAD:
1445              ;SKIP TO NON GRAPHIC CHARACTER
1446 0D98 CD5C10 CALL   DISKR ;READ THE NEXT CHARACTER
1447 0D9B FE20     CPI    ' ' ;BELOW SPACE IF NON GRAPHIC
1448 0D9D DA770D JC     LOADSY0 ;FOR THE NEXT CHARACTER TEST
1449 0DA0 C3980D JMP    SKLOAD ;TO BYPASS ANOTHER CHARACTER
1450              ;
1451              OKLOAD:
1452 0DA3 2A0600 LHLD   BDOSE+1 ;POINTER TO TOPMOST JMP XXX AROUND TABLE
1453 0DA6 1E00     HVI    E,0 ;COUNTS THE SYMBOL LENGTH
1454              LOADCH: ;LOAD CHARACTERS
1455 0DA8 2B       DCX    H ;NEXT TO FILL
1456 0DA9 CD5C10 CALL   DISKR ;NEXT CHAR TO A

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1457  ODAC FE09      CPI    TAB    ;END OF SYMBOL?
1458  ODAE CAC60D    JZ      SYEND
1459  ODB1 FE0D      CPI    CR      ;MAY BE END OF LINE
1460  ODB3 CAC60D    JZ      SYEND
1461  ODB6 FE21      CPI    ' ' +1 ;GRAPHIC?
1462  ODB8 DA9410    JC      CERROR  ;IT MUST BE
1463  ODBB 77        MOV     M,A     ;SAVE IT IN MEMORY
1464  ODBC 1C        INR     E       ;COUNT THE LENGTH UP
1465  ODBD 7B        MOV     A,E     ;PAST 16?
1466  ODBE FE10      CPI    16
1467  ODC0 D29410    JNC     CERROR  ;ERROR IF LONGER THAN 16 CHARS
1468  ODC3 C3A80D    JMP     LOADCH  ;FOR ANOTHER CHARACTER
1469                      ;
1470          SYEND: ;END OF CURRENT SYMBOL, SET POINTERS FOR THIS ONE
1471                      ;
1472                      ;   STRUCTURE IS:
1473                      ;       HIGH BDOS
1474                      ;       LOW BDOS
1475                      ;   BJUMP: JMP
1476                      ;       ...
1477                      ;       HIGH BJUMP
1478                      ;       LOW BJUMP
1479                      ;   BDOSE: JMP
1480                      ;
1481                      ;   CONSTRUCTING SYMBOL BELOW BJUMP OF THE FORM
1482                      ;       HIGH ADDR
1483                      ;       LOW ADDR
1484                      ;   BJUMP: LENGTH
1485                      ;       CHAR1
1486                      ;       ...
1487                      ;       CHAR LENGTH
1488                      ;
1489                      ;   THEN MOVE JMP BDOS DOWN BELOW THE SYMBOL
1490          ODC6 D5      PUSH    D       ;SAVE THE LENGTH
1491          ODC7 E5      PUSH    H       ;SAVE THE NEXT TO FILL
1492          ODC8 EB      XCHG         ;DE CONTAINS THE NEXT TO FILL
1493          ODC9 2A0600  LHLD     BDOSE+1 ;ADDRESS OF THE JMP XXX ABOVE SYMBOL
1494          ODCC 23      INX     H       ;LOW JUMP ADDRESS
1495          ODCD 5E      MOV     E,M     ;TO E FOR NOW
1496          ODCE 23      INX     H       ;HIGH JUMP ADDRESS
1497          ODCF 56      MOV     D,M     ;DE IS THE XXX FOR THE JMP XXX TO INSTALL
1498          ODD0 E1      POP     H       ;NEXT TO FILL ADDRESS
1499          ODD1 72      MOV     M,D     ;HIGH ORDER ADDRESS
1500          ODD2 2B      DCX     H       ;.LOW ADDRESS
1501          ODD3 73      MOV     M,E     ;XXX FILLED BELOW SYMBOL
1502          ODD4 2B      DCX     H       ;.JMP
1503          ODD5 36C3    MVI     M,JMP  ;JUMP INSTRUCTION FILLED
1504                      ;
1505          ODD7 CD9312  CALL     COMLOAD ;HL > MLOAD ?
1506          ODDA D29410  JNC     CERROR  ;CY IF SO
1507          ODDD EB      XCHG         ;JMP XXX ADDRESS TO DE
1508          ODDE 2A0600  LHLD     BDOSE+1 ;PREVIOUS JMP XXX ADDRESS
1509          ODE1 EB      XCHG         ;TO DE, HL IS NEW JMP XXX ADDRESS
1510          ODE2 220600  SHLD     BDOSE+1 ;CHANGED JUMP ADDRESS IN LOW MEM
1511          ODE5 EB      XCHG         ;OLD JUMP ADDRESS BACK TO HL
1512          ODE6 D1      POP     D       ;LENGTH IS IN E

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1513 0DE7 73      MOV    H,E      ;STORED TO MEMORY
1514 0DE8 23      INX     H        ;LOW ADDRESS LOCATION
1515 0DE9 D1      POP     D        ;LOW ADDRESS IN DE
1516 0DEA 73      MOV     H,E
1517 0DEB 23      INX     H        ;HIGH ADDRESS LOCATION
1518 0DEC 72      MOV     H,D
1519             ;      NOW READY FOR ANOTHER SYMBOL
1520 0DED C3740D   JMP     LOADSY
1521             ;
1522             ;      END OF THE SYMBOL LOAD SUBROUTINE
1523 PRSTAT:        ;PRINT THE STATISTICS FOR THE LOAD OR START UTILITY
1524 0DF0 F1      POP     PSW      ;ZERO FLAG SET IF THIS IS A UTILITY
1525 0DF1 C2060E   JNZ     PRSTATO ;SKIP IF NOT UTILITY
1526             ;
1527             ;      THIS IS A DDT UTILITY, START IT
1528 0DF4 21FC0D   LXI     H,RETUTL ;RETURN ADDRESS FROM UTILITY
1529 0DF7 E5      PUSH    H        ;TO STACK
1530 0DF8 2A761A   LHLD    PLOC    ;PROBABLY = PCBASE
1531 0DFB E9      PCHL          ;GONE TO THE UTILITY ...
1532             ;
1533 RETUTL:
1534             ;RETURN HERE TO RESET THE SYMBOL TABLE BASE
1535 0DFC 2A0600   LHLD    BD0SE+1 ;NEW BASE OF MODULES
1536 0DFF 19      DAD     D        ;DE IS LENGTH OF SYMBOLS INSERTED BY UTILITY
1537 0E00 22B119   SHLD    SYTOP    ;NEW SYMBOL TOP
1538 0E03 C32C07   JMP     START    ;FOR ANOTHER COMMAND
1539             ;
1540             ;
1541 PRSTATO:
1542             ;      NOT A DDT UTILITY, PRINT STATISTICS
1543 0E06 219019   LXI     H,LMSG  ;'NEXT PC END'
1544 0E09 CDD112   CALL    PRMSG  ;PRINTED TO CONSOLE
1545 0E0C 2AA719   LHLD    DEFLOAD ;DEFAULT LOAD ADDRESS
1546 0E0F CD4C13   CALL    PADDR
1547 0E12 CDC212   CALL    BLANK
1548 0E15 2A8319   LHLD    MLOAD  ;NEXT ADDRESS
1549 0E18 CD4C13   CALL    PADDR
1550 0E1B CDC212   CALL    BLANK  ;FOLLOWING BLANK
1551 0E1E 2A761A   LHLD    PLOC    ;PC VALUE
1552 0E21 CD4C13   CALL    PADDR
1553 0E24 CDC212   CALL    BLANK  ;NEXT AND PC PRINTED
1554 0E27 2A0600   LHLD    BD0SE+1 ;END OF MEMORY+1
1555 0E2A 2B      DCX     H        ;REAL END OF MEMORY
1556 0E2B CD4C13   CALL    PADDR
1557 0E2E C32C07   JMP     START    ;FOR THE CRLF
1558             ;
1559             ;
1560             ;
1561             ;
1562             ;      *****
1563             ;      *
1564             ;      *      S - SET MEMORY      *
1565             ;      *
1566             ;      *****
1567             ;
1568 SETMEN:        ;ONE EXPRESSION EXPECTED

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1569 0E31 CD6F11      CALL  SCANWORD      ;SETS FLAGS
1570 0E34 3D          DCR    A          ;ONE EXPRESSION ONLY
1571 0E35 C29410      JNZ    CERROR
1572 0E38 CD8D13      CALL  GETVAL      ;START ADDRESS IS IN H,L
1573 0E3B CDF412      SETMO: CALL  CRLF      ;NEW LINE
1574 0E3E E5          PUSH   H          ;SAVE CURRENT ADDRESS
1575 0E3F CD4C13      CALL  PADDR      ;ADDRESS PRINTED
1576 0E42 CDC212      CALL  BLANK      ;SEPARATOR
1577 0E45 E1          POP    H          ;GET DATA
1578 0E46 E5          PUSH   H          ;SAVE ADDRESS TO FILL
1579                ; CHECK FOR DISPLAY MODE
1580 0E47 3AF019      LDA    WDISP
1581 0E4A B7          ORA    A          ;WORD MODE?
1582 0E4B CA580E      JZ     SETBYTE
1583                ; SET WORDS OF MEMORY
1584 0E4E 5E          MOV    E,M        ;LOW ORDER BYTE
1585 0E4F 23          INX    H
1586 0E50 56          MOV    D,M        ;HIGH ORDER BYTE
1587 0E51 EB          XCHG
1588 0E52 CD4C13      CALL  PADDR      ;ADDRESS VALUE PRINTED
1589 0E55 C35C0E      JMP    SETGET     ;GET VALUE FROM INPUT
1590                ;
1591                SETBYTE:
1592                ; BYTE MODE SET
1593 0E58 7E          MOV    A,M
1594 0E59 CDEA12      CALL  PBYTE      ;PRINT BYTE
1595 0E5C CDC212      SETGET: CALL  BLANK      ;ANOTHER SEPARATOR
1596 0E5F CD4A11      CALL  GETBUFF     ;FILL INPUT BUFFER
1597 0E62 CD1512      CALL  GNC         ;MAY BE EMPTY (NO CHANGE)
1598 0E65 E1          POP    H          ;RESTORE ADDRESS TO FILL
1599 0E66 FE0D      CPI    CR
1600 0E68 CAAFOE      JZ     SETM1
1601 0E6B FE2E      CPI    ','
1602 0E6D C2790E      JNZ    CHKASC      ;SKIP TO CHECK ASCII
1603                ; MUST BE LENGTH ZERO (OTHERWISE .SYMBOL)
1604 0E70 3A051A      LDA    CURLEN
1605 0E73 B7          ORA    A
1606 0E74 CA2C07      JZ     START        ;FOR NEXT COMMAND
1607 0E77 3E2E      MVI    A,','        ;OTHERWISE RESTORE
1608                CHKASC:
1609 0E79 FE22      CPI    ''          ;ASCII INPUT?
1610                ; FILLING ASCII/ BYTE/ ADDRESS DATA
1611 0E7B E5          PUSH   H          ;SAVE ADDRESS TO FILL
1612 0E7C C28E0E      JNZ    SETHEX      ;HEX SINGLE OR DOUBLE PRECISION
1613                ; SET ASCII DATA TO MEMORY
1614 0E7F CD2112      SETASC: CALL  GNLG      ;NEXT BYTE TO FILL
1615 0E82 E1          POP    H          ;NEXT ADDRESS TO FILL
1616 0E83 FE0D      CPI    CR          ;END OF LINE
1617 0E85 CA3B0E      JZ     SETMO      ;FOR NEXT INPUT
1618 0E88 77          MOV    M,A        ;OTHERWISE STORE IT
1619 0E89 23          INX    H          ;TO NEXT ADDRESS TO FILL
1620 0E8A E5          PUSH   H          ;SAVE THE ADDRESS
1621 0E8B C37F0E      JMP    SETASC
1622                ;
1623                ; BYTE OR ADDRESS DATA IS BEING CHANGED
1624                SETHEX:

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1625 0E8E CD8111      CALL  SCANEX  ;FIRST CHARACTER ALREADY SCANNED
1626 0E91 3D          DCR    A          ;ONE ITEM?
1627 0E92 C29410      JNZ    CERROR  ;MORE THAN ONE
1628 0E95 CD8D13      CALL  GETVAL  ;VALUE TO H,L
1629 0E98 3AF019      LDA    WDISP  ;WORD MODE?
1630 0E9B B7          ORA    A          ;WORD MODE=FF
1631 0E9C CAA80E      JZ     SETBYT0
1632                ;      FILLING DOUBLE PRECISION VALUE
1633 0E9F EB          XCHG          ;VALUE TO DE
1634 0EA0 E1          POP    H          ;RECALL FILL ADDRESS
1635 0EA1 73          MOV    M,E      ;LOW ORDER
1636 0EA2 23          INX    H          ;ADDRESSING HIGH ORDER POSITION
1637 0EA3 72          MOV    M,D      ;FILLED
1638 0EA4 23          INX    H          ;MOVE TO NEXT ADDRESS
1639 0EA5 C33B0E      JMP    SETH0    ;FOR THE NEXT ADDRESS
1640                ;
1641                ;      FILLING BYTE VALUE
1642                ;      SETBYT0:
1643 0EA8 B7          ORA    A          ;HIGH ORDER MUST BE ZERO
1644 0EA9 C29410      JNZ    CERROR  ;DATA IS IN L
1645 0EAC 7D          MOV    A,L
1646 0EAD E1          POP    H          ;RESTORE DATA VALUE
1647 0EAE 77          MOV    M,A
1648 0EAF 23          SETM1: INX    H          ;NEXT ADDRESS READY
1649 0EB0 3AF019      LDA    WDISP
1650 0EB3 B7          ORA    A          ;WORD MODE?
1651 0EB4 CA3B0E      JZ     SETH0    ;SKIP INX IF SO
1652 0EB7 23          INX    H          ;TO NEXT DOUBLE WORD
1653 0EB8 C33B0E      JMP    SETH0
1654                ;
1655                ;      *****
1656                ;      *
1657                ;      *      U - UNTRACE MODE      *
1658                ;      *
1659                ;      *****
1660                ;
1661                ;      UNTRACE:
1662 0EBB 3E01          MVI    A,1      ;UNTRACE MODE = 1
1663 0EBD C3C20E      JMP    ETRACE
1664                ;
1665                ;      *****
1666                ;      *
1667                ;      *      T - START TRACE      *
1668                ;      *
1669                ;      *****
1670                ;
1671 0EC0 3E02          TRACE: MVI    A,2      ;SET TRACE MODE FLAG=2
1672                ;      ETRACE:
1673 0EC2 32A919      STA    TMODE
1674                ;      ALLOW TW/UW TO SUPPRESS OUT-OF-LINE TRACE
1675 0EC5 CD6F11      CALL  SCANWORD
1676 0EC8 210000      LXI    H,0
1677 0ECB 22AA19      SHLD   USERBRK      ;CLEAR USERBRK
1678 0ECE 23          INX    H          ;DEFAULT TO ONE TRACE
1679 0ECF CAEFOE      JZ     TRACO
1680                ;      EXPRESSIONS WERE GIVEN, FORMS ARE

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1681      ; TX      TRACE FOR X STEPS      ACC = 1
1682      ; TX,BRK  TRACE FOR X STEPS, CALL "BRK" AT EACH STOP  ACC=2
1683      ; T,BRK   CALL "BRK"             ACC = 1, CY = 1
1684      ;
1685 0ED2 DADFOE      JC      SETTRO
1686 0ED5 CD8D13      CALL   GETVAL ;TO H,L
1687 0ED8 F5          PUSH   PSW
1688 0ED9 7D          MOV    A,L      ;CHECK FOR ZERO
1689 0EDA B4          ORA     H
1690 0EDB CA9410      JZ      CERROR
1691 0EDE F1          POP     PSW      ;RECALL NUMBER OF PARAMETERS
1692      SETTRO:      ;H,L CONTAINS TRACE COUNT, SAVE IT FOR LATER
1693 0EDF E5          PUSH   H
1694      ; LOOK FOR BREAK ADDRESS
1695 0EE0 3D          DCR     A      ;IF ONLY ONE SPECIFIED, THEN SKIP USERBRK
1696 0EE1 CAEE0E      JZ      SETTR1
1697 0EE4 3D          DCR     A      ;MUST BE TWO VALUES
1698 0EE5 C29410      JNZ     CERROR ;MORE THAN TWO SPECIFIED
1699 0EE8 CD8D13      CALL   GETVAL ;VALUE TO H,L
1700 0EEB 22AA19      SHLD   USERBRK
1701      SETTR1:      ;RECALL TRACE COUNT
1702 0EEE E1          POP     H
1703 0EEF 22AC19      TRACO: SHLD  TRACER
1704 0EF2 AF          XRA     A      ;00 TO ACCUM
1705 0EF3 326D19      STA     GOBRKS ;MARK AS NO USER BREAKS
1706 0EF6 CD4E15      CALL   DSTATE ;STARTING STATE IS DISPLAYED
1707 0EF9 C36C09      JMP     Gopr    ;SETS BREAKPOINTS AND STARTS EXECUTION
1708      ;
1709      ; *****
1710      ; * * * * *
1711      ; *      V - VALUE      *
1712      ; * * * * *
1713      ; *****
1714      ;
1715      VALUE:
1716 0EFC C3060E      JMP     PRSTATO
1717      ;
1718      ;
1719      ; *****
1720      ; * * * * *
1721      ; *      W - WRITE      *
1722      ; * * * * *
1723      ; *****
1724      ;
1725      WRITE:
1726 0EFF 3A051A      LDA     CURLEN
1727 0F02 B7          ORA     A
1728 0F03 CA9410      JZ      CERROR      ;EXIT IF NO FILE PRESENT
1729      ;
1730      ;
1731 0F06 215C00      LXI     H,FCB      ;LOAD HL WITH FCB ADDRESS
1732 0F09 CDD111      CALL   GETFILE    ;OBTAIN FILE FROM COMMAND STRING
1733 0F0C 3E00      MVI     A,00H
1734 0F0E 327C00      STA     FCB+32    ;ZERO OUT THE RECORD COUNT
1735 0F11 210001      LXI     H,0100H
1736 0F14 22B019      SHLD   WBEGIN    ;STORE BEGINING ADDRESS

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1737 0F17 2AA719      LHLD  DEFLOAD      ;GET DEFAULT END ADDRESS
1738 0F1A 22B219      SHLD  WEND        ;STORE IN WRITE END
1739                      ;
1740 0F1D CD7E11      CALL  SCANEXP      ;CHECK FOR SPECIFIED ADDRESS
1741 0F20 3AFB19      LDA    EXPLIST      ;GET NUMBER OF EXPRESSIONS
1742 0F23 B7          ORA    A            ;
1743 0F24 CA380F      JZ     NOWRPRM
1744                      ;
1745 0F27 FE02          CPI    2
1746 0F29 C29410      JNZ    CERROR      ;ERROR IF NOT TWO EXPR
1747 0F2C 2AFC19      LHLD  EXPLIST+1    ;HL = START ADDRESS
1748 0F2F 22B019      SHLD  WBEGIN        ;STORE IN BEGIN
1749 0F32 2AFE19      LHLD  EXPLIST+3    ;HL = FINISH ADDRESS
1750 0F35 22B219      SHLD  WEND        ;STORE IN END
1751                      ;
1752                      ; CONTINUE WITH WRITE
1753 NOWRPRM:
1754                      ;
1755 0F38 2AB019      LHLD  WBEGIN        ;HL = BEGINNING ADDRESS
1756 0F3B CDA00F      CALL  CHKEND        ;IS END > BEGIN ?
1757 0F3E DA9410      JC     CERROR      ; IF SO ERROR
1758                      ;
1759 0F41 210000      LXI    H,00H        ;GET READY TO ZERO OUT
1760 0F44 22AE19      SHLD  WRTREC        ;# OF RECORDS WRITTEN
1761                      ;
1762                      ; NOW THAT FCB IS SET UP GET READY TO WRITE OUT
1763                      ; TO THE SPECIFIED FILE.
1764                      ;
1765 0F47 115C00      LXI    D,DFCB
1766 0F4A CD7A12      CALL  DELETE
1767                      ;
1768 0F4D CD6E12      CALL  MAKE
1769 0F50 3C          INR    A
1770 0F51 CA9410      JZ     CERROR
1771 0F54 2AB019      LHLD  WBEGIN        ;GET BEGINNING ADDRESS
1772                      ;
1773 WLOOP0:
1774 0F57 CDAF0F      CALL  WFLAG
1775 0F5A 118000      LXI    D,DBF        ;DE = DEFAULT DMA ADDRESS
1776 0F5D 0E80        MVI    C,80H      ;COUNTER FOR LOOP
1777                      ;
1778 WLOOP1:
1779 0F5F 7E          MOV    A,M        ;GET BYTE
1780 0F60 23          INX    H          ;BUMP POINTER
1781 0F61 12          STAX   D          ;STORE IN BUFFER
1782 0F62 13          INX    D          ;BUMP POINTER
1783 0F63 0D          DCR    C          ;DECREMENT COUNTER
1784 0F64 C25F0F      JNZ    WLOOP1     ;AGAIN IF NOT FINISHED
1785                      ;
1786 0F67 115C00      LXI    D,DFCB
1787 0F6A CD5612      CALL  DWRITE      ;WRITE IT OUT
1788 0F6D B7          ORA    A          ;SET FLAGS FOR WRITE CHECK
1789 0F6E C29410      JNZ    CERROR      ;ERROR IF NOT 0
1790 0F71 E5          PUSH   H          ;SAVE SOURCE ADDRESS
1791 0F72 2AAE19      LHLD  WRTREC      ;GET # OF RECORDS WRITTEN
1792 0F75 23          INX    H          ;BUMP IT BY ONE

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1793 0F76 22AE19      SHLD  WRTREC      ;PUT IT BACK
1794 0F79 E1          POP    H          ;GET SOURCE ADDRESS BACK
1795                  ;
1796 0F7A CDA00F      CALL   CHKEND
1797                  ;
1798 0F7D 3ACCOF      LDA     ONEFLG      ;SET FOR FLAG CHECK
1799 0F80 FEFF        CPI     TRUE        ;LAST RECORD?
1800 0F82 C2570F      JNZ     WLOOP0      ;NEXT RECORD IF NOT FINISHED
1801                  WCLOSE:
1802 0F85 115C00      LXI     D,DFCB
1803 0F88 CD4A12      CALL   CLOSE
1804                  ;
1805 0F8B 21B419      LXI     H,WRTMSG
1806 0F8E CDD112      CALL   PRMSG
1807 0F91 2AAE19      LHL    WRTREC      ;# OF RECORDS
1808 0F94 CD4C13      CALL   PADDR
1809 0F97 21B719      LXI     H,WRTMSG1
1810 0F9A CDD112      CALL   PRMSG      ;PRINT OUT END OF STRING
1811                  ;
1812 0F9D C32C07      JMP     START      ;EXIT
1813                  ;
1814                  CHKEND:
1815 0FA0 3AB219      LDA     WEND          ;GET HIGH ORDER END BYTE
1816 0FA3 95          SUB     L          ;GET LOW ORDER
1817 0FA4 32CDOF      STA     RSLT      ;LOW ORDER IN RSLT
1818 0FA7 3AB319      LDA     WEND+1      ;HIGH ORDER EQUAL CHECK
1819 0FAA 9C          SBB     H          ;SUB HIGH ORDER
1820 0FAB 32CE0F      STA     RSLT+1      ;HIGH ORDER ANSWER
1821 0FAE C9          RET
1822                  ;
1823                  WFLAG:
1824 0FAF 3E00        MVI     A,FALSE ;ZERO OUT FLAG
1825 0FB1 32CC0F      STA     ONEFLG ;STORE
1826 0FB4 3ACE0F      LDA     RSLT+1
1827 0FB7 FE00        CPI     00H
1828 0FB9 C0          RNZ
1829 0FBA 3ACDOF      LDA     RSLT
1830 0FBD FE80        CPI     080H ;RECORD LENGTH
1831 0FBF DAC60F      JC      WFLAG1
1832 0FC2 CAC60F      JZ      WFLAG1
1833 0FC5 C9          RET
1834                  WFLAG1:
1835 0FC6 3EFF        MVI     A,TRUE
1836 0FC8 32CC0F      STA     ONEFLG
1837 0FCB C9          RET
1838                  ;
1839 0FCC 00          ONEFLG: DB 0
1840 0FCD 0000        RSLT: DW 0
1841                  ;
1842                  ;*****
1843                  ; * * * * *
1844                  ; * X - EXAMINE *
1845                  ; * * * * *
1846                  ;*****
1847                  ;
1848                  EXAMINE:

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1849 OFCF CD1512      CALL GNC      ;CR?
1850 OFD2 FE0D        CPT CR
1851 OFD4 C2DD0F      JNZ EXAM0
1852 OFD7 CD4E15      CALL DSTATE ;DISPLAY CPU STATE
1853 OFDA C32C07      JMP START
1854
1855                  ;
1856 OFDD 010800      LXI B,PVAL+1 ;B=0,C=PVAL (MAX REGISTER NUMBER)
1857                  ; LOOK FOR REGISTER MATCH IN RVECT
1858 OFE0 213916      LXI H,RVECT
1859 OFE3 BE          EXAM1: CMP M ;MATCH IN RVECT?
1860 OFE4 CAF00F      JZ EXAM2
1861 OFE7 23          INX H ;NEXT RVECT
1862 OFE8 04          INR B ;INCREMENT COUNT
1863 OFE9 0D          DCR C ;END OF RVECT?
1864 OFEA C2E30F      JNZ EXAM1
1865                  ; NO MATCH
1866 OFED C39410      JMP CERROR
1867                  ;
1868                  EXAM2: ;MATCH IN RVECT, B HAS REGISTER NUMBER
1869 OFF0 CD1512      CALL GNC
1870 OFF3 FE0D        CPI CR ;ONLY CHARACTER?
1871 OFF5 C29410      JNZ CERROR
1872
1873                  ;
1874 OFF8 C5          PUSH B ;SAVE COUNT
1875 OFF9 CDA12        CALL CRLF ;NEW LINE FOR ELEMENT
1876 OFFC CD1E15      CALL DELT ;ELEMENT WRITTEN
1877 OFFF CDC212      CALL BLANK
1878 1002 CD4A11      CALL GETBUFF ;FILL COMMAND BUFFER
1879 1005 CD7E11      CALL SCANEXP ;GET INPUT EXPRESSION
1880 1008 B7          ORA A ;NONE?
1881 1009 CA2C07      JZ START
1882 100C 3D          DCR A ;MUST BE ONLY ONE
1883 100D C29410      JNZ CERROR
1884 1010 CD8D13      CALL GETVAL ;VALUE IS IN H,L
1885 1013 C1          POP B ;RECALL REGISTER NUMBER
1886                  ; CHECK CASES FOR FLAGS, REG-A, OR DOUBLE REGISTER
1887 1014 78          MOV A,B
1888 1015 FE05        CPI AVAL
1889 1017 D24110      JNC EXAM4
1890                  ; SETTING FLAGS, MUST BE ZERO OR ONE
1891 101A 7C          MOV A,H
1892 101B B7          ORA A
1893 101C C29410      JNZ CERROR
1894 101F 7D          MOV A,L
1895 1020 FE02        CPI 2
1896 1022 D29410      JNC CERROR
1897                  ; 0 OR 1 IN H,L REGISTERS - GET CURRENT FLAGS AND MASK POSITION
1898 1025 CDE714      CALL FLGSHF
1899                  ; SHIFT COUNT IN C, D,E ADDRESS FLAG POSITION
1900 1028 67          MOV H,A ;FLAGS TO H
1901 1029 41          MOV B,C ;SHIFT COUNT TO B
1902 102A 3EFE        MVI A,0FEH ;111111110 IN ACCUM TO ROTATE
1903 102C CD3B10      CALL LROTATE ;ROTATE REG-A LEFT
1904 102F A4          ANA H ;MASK ALL BUT ALTERED BIT

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1905 1030 41      MOV    B,C    ;RESTORE SHIFT COUNT TO B
1906 1031 67      MOV    H,A    ;SAVE MASKED FLAGS
1907 1032 7D      MOV    A,L    ;0/1 TO LSB OF ACCUM
1908 1033 CD3B10  CALL    LROTATE ;ROTATED TO CHANGED POSITION
1909 1036 B4      ORA     H      ;RESTORE ALL OTHER FLAGS
1910 1037 12      STAX    D      ;BACK TO MACHINE STATE
1911 1038 C32C07  JMP     START  ;FOR ANOTHER COMMAND
1912
1913              ;
LROTATE:          ;LEFT ROTATE FOR FLAG SETTING
1914              ; PATTERN IS IN REGISTER A, COUNT IN REGISTER B
1915 103B 05      DCR     B
1916 103C C8      RZ         ;ROTATE COMPLETE
1917 103D 07      RLC      ;END-AROUND ROTATE
1918 103E C33B10  JMP     LROTATE
1919              ;
1920              EXAM4: ;MAY BE ACCUMULATOR CHANGE
1921 1041 C25110  JNZ     EXAM5
1922              ; MUST BE BYTE VALUE
1923 1044 7C      MOV     A,H
1924 1045 B7      ORA     A
1925 1046 C29410  JNZ     CERROR
1926 1049 7D      MOV     A,L    ;GET BYTE TO STORE
1927 104A 21711A  LXI     H,ALOC  ;A REG LOCATION IN MACHINE STATE
1928 104D 77      MOV     M,A    ;STORE IT AWAY
1929 104E C32C07  JMP     START
1930              ;
1931              EXAM5: ;MUST BE DOUBLE REGISTER PAIR
1932 1051 E5      PUSH    H      ;SAVE VALUE
1933 1052 CD0515  CALL    GETDBA  ;DOUBLE ADDRESS TO HL
1934 1055 D1      POP     D      ;VALUE TO D,E
1935 1056 73      MOV     M,E
1936 1057 23      INX     H
1937 1058 72      MOV     M,D    ;ALTERED MACHINE STATE
1938 1059 C32C07  JMP     START
1939              ;
1940              DISKR: ;DISK READ
1941 105C E5      PUSH    H
1942 105D D5      PUSH    D
1943 105E C5      PUSH    B
1944              ;
1945              RDI:  ;READ DISK INPUT
1946 105F 3A5B00  LDA     DBP
1947 1062 E67F  ANI     7FH
1948 1064 CA7C10  JZ      NDI     ;GET NEXT DISK INPUT RECORD
1949              ;
1950              ; READ CHARACTER
1951              RDC:
1952 1067 1600  MVI     D,0
1953 1069 5F  MOV     E,A
1954 106A 218000 LXI     H,DBF
1955 106D 19  DAD     D
1956 106E 7E  MOV     A,M
1957 106F FE1A  CPI     DEOF
1958 1071 CA9010 JZ      RRET    ;END OF FILE
1959 1074 215B00 LXI     H,DBP
1960 1077 34  INR     M

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1961 1078 B7      ORA    A
1962 1079 C39010  JMP    RRET
1963              ;
1964              NDI:   ;NEXT BUFFER IN
1965 107C 0E14      MVI    C,RDF
1966 107E 115C00    LXI    D,DFCB
1967 1081 CDA406    CALL   TRAPAD
1968 1084 B7      ORA    A
1969 1085 C28E10    JNZ    DEF
1970              ;
1971              ;      BUFFER READ OK
1972 108B 325B00    STA    DBP      ;STORE 00H
1973 108B C36710    JMP    RDC
1974              ;
1975              DEF:   ;STORE EOF AND RETURN (END FILE)
1976 108E 3E1A      MVI    A,DEOF
1977              RRET:
1978 1090 C1      POP    B
1979 1091 D1      POP    D
1980 1092 E1      POP    H
1981 1093 C9      RET
1982              ;
1983              ;      *****
1984              ;      *
1985              ;      *      ERROR ROUTINES      *
1986              ;      *
1987              ;      *****
1988              ;
1989              CERROR:
1990              ;ERROR IN COMMAND
1991 1094 CDF412    CALL   CRLF
1992 1097 3E3F      MVI    A,'?'
1993 1099 CDC412    CALL   PCHAR
1994 109C C32C07    JMP    START
1995              ;
1996              ;      *****
1997              ;      *
1998              ;      *      GENERAL PURPOSE SUBROUTINES      *
1999              ;      *
2000              ;      *****
2001              ;
2002              COMDEF:
2003 109F 216500    LXI    H,FCB+9      ;SET UP ADDRESS
2004 10A2 3E43      MVI    A,'C'
2005 10A4 77      MOV    M,A      ;STORE IT
2006 10A5 23      INX    H
2007 10A6 3E4F      MVI    A,'O'
2008 10A8 77      MOV    M,A      ;STORE IT
2009 10A9 23      INX    H
2010 10AA 3E4D      MVI    A,'M'
2011 10AC 77      MOV    M,A
2012 10AD C9      RET
2013              ;
2014              ;
2015              SYMDEF:
2016 10AE 217500    LXI    H,FCB+019H      ;SET UP ADDRESS

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2017 10B1 3E53      MVI    A,'S'
2018 10B3 77        MOV     M,A          ;STORE IT
2019 10B4 23        INX     H
2020 10B5 3E59      MVI    A,'Y'
2021 10B7 77        MOV     M,A          ;STORE IT
2022 10B8 23        INX     H
2023 10B9 3E4D      MVI    A,'M'
2024 10BB 77        MOV     M,A
2025 10BC C9        RET
2026                ;
2027                ;
2028                FILDEL:
2029                ;FILE CHARACTER DELIMITER IN A?
2030 10BD FE2E      CPI     ','
2031 10BF C8        RZ
2032                FILDELO:
2033 10C0 FE2C      CPI     ','          ;COMMA?
2034 10C2 C8        RZ
2035 10C3 FE0D      CPI     CR
2036 10C5 C8        RZ
2037 10C6 FE2A      CPI     '*'
2038 10C8 C8        RZ          ;SERIES OF '?'S
2039 10C9 FE20      CPI     ' '
2040 10CB C9        RET          ;ZERO FOR CR, ., OR BLANK
2041                ;
2042                FILFIELD:
2043                ;FILL THE CURRENT FCB FIELD TO MAX C CHARACTERS
2044 10CC CDBD10     CALL    FILDEL ;DELIMITER?
2045 10CF CAE510     JZ      FILF1  ;SKIP IF SO
2046 10D2 77        MOV     M,A
2047 10D3 23        INX     H          ;CHARACTER FILLED
2048 10D4 CD0D12     CALL    GNFCB  ;GET NEXT CHARACTER
2049 10D7 0D        DCR     C          ;FIELD LENGTH EXHAUSTED?
2050 10D8 C2CC10     JNZ     FILFIELD;FOR ANOTHER CHARACTER
2051                ; CLEAR TO DELIMITER
2052 10DB CDBD10     FILF0: CALL    FILDEL
2053 10DE C8        RZ          ;RETURN WITH DELIMITER IN A
2054 10DF CD0D12     CALL    GNFCB  ;GET ANOTHER CHAR
2055 10E2 C3DB10     JMP     FILF0  ;TO REMOVE IT
2056                ;
2057                FILF1: ;DELIMITER FOUND BEFORE FIELD EXHAUSTED
2058 10E5 1620      MVI     D,' '      ;FILL WITH BLANKS?
2059 10E7 FE2A      CPI     '*'
2060 10E9 C2F110     JNZ     FILF2  ;YES, IF NOT *
2061 10EC CD0D12     CALL    GNFCB  ;READ PAST THE *
2062 10EF 163F      MVI     D,'?'     ;OTHERWISE FILL WITH '?'S
2063 10F1 72        FILF2: MOV     M,D ;FILL REMAINDER WITH BLANKS/QUESTIONS
2064 10F2 23        INX     H          ;TO NEXT CHARACTER
2065 10F3 0D        DCR     C          ;COUNT FIELD LENGTH DOWN
2066 10F4 C2F110     JNZ     FILF2  ;FOR ANOTHER BLANK
2067 10F7 C9        RET          ;WITH DELIMITER IN REG-A
2068                ;
2069                ;
2070                BCDE: ;COMPARE BC > DE (CARRY GEN'D IF TRUE)
2071 10F8 7B        MOV     A,E
2072 10F9 91        SUB     C

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2073 10FA 7A      MOV    A,D
2074 10FB 98      SBB    B
2075 10FC C9      RET
2076              ;
2077              WRPCHK:
2078 10FD E5      PUSH   H
2079 10FE D5      PUSH   D
2080 10FF C5      PUSH   B
2081 1100 50      MOV    D,B
2082 1101 59      MOV    E,C
2083 1102 21FFFF  LXI    H,0FFFFH
2084 1105 C0C11   CALL   HLDE
2085 1108 C1      POP    B
2086 1109 D1      POP    D
2087 110A E1      POP    H
2088 110B C9      RET
2089              ;
2090              HLDE:
2091 110C 7C      MOV    A,H      ;ACC = H
2092 110D BA      CMP    D        ;IS H <= D
2093 110E D8      RC              ;RETURN IF H < D WITH CARRY
2094 110F C0      RNZ              ;RETURN IF H > D
2095 1110 7D      MOV    A,L      ;LOW ORDER CHECK H = D
2096 1111 BB      CMP    E        ;WHAT IS THE RELATIONSHIP
2097              ; H = D SO TEST LOWER BYTE
2098 1112 D8      RC              ;RETURN IF L < E WITH CARRY
2099 1113 C0      RNZ              ;RETURN IF L > E
2100 1114 AF      XRA    A        ;SET ZERO FOR EQUALITY
2101 1115 C9      RET
2102              ;
2103              NODIS: ;REMOVE DIS/ASSEMBLER FROM MEMORY IMAGE
2104 1116 3E01     MVI    A,1
2105 1118 328519   STA    DASH      ;MARKS DIS/ASSEM AS MISSING
2106 111B 218006   LXI    H,DEMON
2107 111E 220600   SHLD   BDOSE+1 ;EXCLUDE DIS/ASSEMBLER
2108 1121 228119   SHLD   SYTOP   ;MARK TOP OF SYMBOL TABLE
2109 1124 C9      RET
2110              ;
2111              ; SCANNERS FOR VARIOUS NEEDS
2112              ;
2113              ;
2114              ; MOVE THE COMMAND BUFFER TO THE DEFAULT AREA AT DBF
2115 1125 11051A   FCBIN: LXI    D,CURLN      ;CURRENT LENGTH DEC'ED AT GNC
2116 1128 218000   LXI    H,DBF          ;DEFAULT BUFFER
2117 112B 1A      LDAX   D              ;DEC'ED LENGTH (EXCLUDE I)
2118 112C 4F      MOV    C,A          ;READY FOR LOOP
2119 112D 77      MOV    M,A          ;STORE DEC'ED LENGTH
2120 112E 0C      INR    C              ;LENGTH READY FOR LOOPING
2121 112F 13      INX    D              ;PAST 'I'
2122 1130 13      DBFILL: INX    D          ;TO FIRST/NEXT CHAR
2123 1131 23      INX    H              ;TO FIRST/NEXT TO FILL
2124 1132 1A      LDAX   D              ;GET NEXT CHAR
2125 1133 E67F    ANI    07FH         ;ZERO OUT LOWER CASE BIT
2126 1135 77      MOV    M,A          ;TO BUFFER
2127 1136 0D      DCR    C              ;END OF BUFFER?
2128 1137 C23011   JNZ    DBFILL      ;LOOP IF NOT

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2129 113A 71      MOV     M,C           ;00 AT END OF BUFFER
2130              ;
2131              ; NOW FILL THE FILE CONTROL BLOCKS AT FCB AND FCB2
2132 113B 1E02     MVI     E,2         ;FILL FCB/FCB2
2133 113D 215C00    LXI     H,FCB      ;START OF DEFAULT FCB
2134 1140 CDD111    CALL    GETFILE
2135              ;
2136              ;
2137              ; NOW CHECK FOR BOTH FCB'S COMPLETE
2138 1143 1D        DCR     E
2139 1144 C4D111    CNZ     GETFILE      ;TO SCAN THE SECOND HALF
2140 1147 3600     MVI     M,0         ;FILL CURRENT RECORD FIELD
2141 1149 C9       RET
2142              ;
2143              ;
2144              ;
2145 GETBUFF:        ;FILL COMMAND BUFFER AND SET POINTERS
2146 114A 0E0A     MVI     C,GETF      ;GET BUFFER FUNCTION
2147 114C 11041A    LXI     D,COMLEN    ;START OF COMMAND BUFFER
2148 114F CDA406    CALL    TRAPAD     ;FILL BUFFER
2149 1152 21061A    LXI     H,COMBUF   ;NEXT TO GET
2150 1155 22021A    SHLD    NEXTCOM
2151 1158 C9       RET
2152              ;
2153              ;
2154 SCAN3:          ;SCAN THREE EXPN'S FOR FILL AND MOVE
2155 1159 CD7E11    CALL    SCANEXP
2156 115C FE03     CPI     3
2157 115E C29410    JNZ     CERROR
2158 1161 CD8D13    CALL    GETVAL
2159 1164 E5       PUSH    H
2160 1165 CD8D13    CALL    GETVAL
2161 1168 E5       PUSH    H
2162 1169 CD8D13    CALL    GETVAL
2163 116C D1       POP     D
2164 116D C1       POP     B           ;BC,DE,HL
2165 116E C9       RET
2166              ;
2167              ;
2168 SCANWORD:       ;PERFORM SCAN, WITH POSSIBLE WORD MODE
2169              ;
2170 116F CD1512    CALL    GNC         ;CHECK FOR W
2171 1172 21F019    LXI     H,WDISP
2172 1175 3600     MVI     M,0         ;CLEAR IT NOW, CHECK FOR W
2173 1177 FE57     CPI     'W'
2174 1179 C28111    JNZ     SCANEX    ;SKIP IF NOT W AND CONTINUE
2175              ; W ENCOUNTERED, SET WORD MODE
2176 117C 36FF     MVI     M,OFFH
2177              ; AND DROP THROUGH FOR REMAINDER OF SCAN
2178              ;
2179 SCANEXP:        ;SCAN EXPRESSIONS - CARRY SET IF ,B
2180              ; ZERO SET IF NO EXPRESSIONS, A SET TO NUMBER OF EXPRESSIONS
2181              ; HI ORDER BIT SET IF ,B ALSO
2182 117E CD1512    CALL    GNC
2183              ;
2184 SCANEX:         ;ENTER HERE IF CHARACTER ALREADY SCANNED

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2185 1181 21FB19 LXI H,EXPLIST
2186 1184 3600 MVI M,0 ;ZERO EXPRESSIONS
2187 1186 23 INX H ;READY TO FILL EXPRESSION LIST
2188 1187 FE0D CPI CR ;END OF LINE?
2189 1189 CAC311 JZ SCANRET
2190 ;
2191 ; NOT CR, MUST BE DIGIT OR COMMA
2192 118C FE2C CPI ','
2193 118E C29C11 JNZ SCANE0
2194 ; MARK AS COMMA
2195 1191 3E80 MVI A,80H
2196 1193 32FB19 STA EXPLIST
2197 1196 110000 LXI D,0
2198 1199 C39F11 JMP SCANE1
2199 ;
2200 SCANE0: ;NOT CR OR COMMA
2201 119C CDA314 CALL GETEXP ;EXPRESSION TO D,E
2202 119F CD9314 SCANE1: CALL SCSTORE ;STORE THE EXPRESSION AND INCREMENT H,L
2203 11A2 FE0D CPI CR
2204 11A4 CAC311 JZ SCANRET
2205 11A7 CD1512 CALL GNC
2206 11AA CDA314 CALL GETEXP
2207 11AD CD9314 CALL SCSTORE
2208 ; SECOND DIGIT SCANNED
2209 11B0 FE0D CPI CR
2210 11B2 CAC311 JZ SCANRET
2211 11B5 CD1512 CALL GNC
2212 11B8 CDA314 CALL GETEXP
2213 11BB CD9314 CALL SCSTORE
2214 11BE FE0D CPI CR
2215 11C0 C29410 JNZ CERROR
2216 SCANRET:
2217 11C3 11FB19 LXI D,EXPLIST ;LOOK AT COUNT
2218 11C6 1A LDAX D ;LOAD COUNT TO ACC
2219 11C7 FE81 CPI 81H ;, WITHOUT B?
2220 11C9 CA9410 JZ CERROR
2221 11CC 13 INX D ;READY TO EXTRACT EXPN'S
2222 11CD B7 ORA A ;ZERO FLAG MAY BE SET
2223 11CE 07 RLC
2224 11CF 0F RRC ;SET CARRY IF NO BIT SET (,B)
2225 11D0 C9 RET ;WITH FLAGS SET
2226 ;
2227 ;
2228 GETFILE:
2229 ; GET FILENAME FOR FCB ROUTINE
2230 FILDISK:
2231 11D1 CD0B12 CALL GNFCB0 ;READ AND CLEAR LOOKAHEAD CHARACTER
2232 11D4 FE20 CPI ','
2233 11D6 CAD111 JZ FILDISK ;DEBLANK INPUT LINE
2234 ;
2235 11D9 F5 PUSH PSW ;SAVE FIRST CHARACTER
2236 11DA CD0B12 CALL GNFCB ;GET SECOND CHARACTER
2237 11DD FE3A CPI ','
2238 11DF C2ED11 JNZ NODISK ;SKIP IF NOT DISK DRIVE
2239 ;
2240 ; DISK SPECIFIED, FILL WITH DRIVE NAME

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2241 11E2 F1      POP    PSW
2242 11E3 D640     SUI    'A'-1 ;NORMALIZED TO 1,2,...
2243 11E5 77       MOV    M,A
2244 11E6 23       INX    H      ;FILLED TO MEMORY
2245 11E7 CD0B12   CALL   GNFCB0 ;SCAN ANOTHER CHARACTER
2246 11EA C3F211   JMP     FILNAM
2247              ;
2248              NODISK:      ;USE DEFAULT DRIVE (00 IN FCB/FCB2)
2249 11ED 47       MOV    B,A      ;SAVE SECOND CHAR
2250 11EE 3600     MVI    M,0
2251 11F0 23       INX    H      ;CHARACTER FILLED
2252 11F1 F1       POP    PSW      ;RECALL ORIGINAL CHARACTER
2253              ;
2254              FILNAM:
2255              ;FILL THE FILE NAME FIELD, FIRST CHARACTER IN A
2256 11F2 0E08     MVI    C,FFNL ;FILE NAME LENGTH
2257 11F4 CDCC10   CALL   FILFIELD;FILED FILLED, PADDED WITH BLANKS
2258 11F7 FE2E     CPI    '.'      ;DELIMITER PERIOD FILENAME.FILETYPE
2259 11F9 CC0D12   CZ      GNFCB  ;CLEAR THE PERIOD
2260              ;
2261 11FC 0E03     MVI    C,FFTL ;FILE TYPE LENGTH IN C
2262 11FE CDCC10   CALL   FILFIELD;FILL THE TYPE FIELD
2263              ;
2264              FILEXT:      ;NOW CLEARED TO NEXT BLANK OR CR
2265 1201 0E04     MVI    C,FCBL/2-FFNL-FFTL-1 ;NUMBER OF BYTES REMAINING
2266              FILEX0:
2267 1203 3600     MVI    M,0
2268 1205 23       INX    H      ;FILL A ZERO
2269 1206 0B       DCR    C
2270 1207 C20312   JNZ     FILEX0
2271 120A C9       RET
2272              ;
2273              ;
2274              ; SET INPUT FILE CONTROL BLOCK (AT 5CH) TO SIMULATE CONSOLE COMMAND
2275              ; USEFUL SUBROUTINES FOR INFCB:
2276              GNFCB0:      ;ZERO THE LOOKAHEAD CHARACTER AND READ
2277 120B 0600     MVI    B,0
2278              GNFCB:      ;GET NEXT FCB CHARACTER FROM LOOKAHEAD OR INPUT
2279 120D 7B       MOV    A,B      ;LOOKAHEAD ACTIVE?
2280 120E 0600     MVI    B,0      ;CLEAR IF 50
2281 1210 B7       ORA    A      ;SET FLAGS
2282 1211 C0       RNZ
2283 1212 C31512   JMP     GNC      ;OTHERWISE GET REAL CHARACTER
2284              ;
2285              GNC:      ;GET NEXT CONSOLE CHARACTER WITH TRANSLATION
2286 1215 CD2112   CALL   GNLC      ;GET NEXT LOWER CASE CHAR
2287              ;DROP THROUGH TO TRANSLATE
2288              TRANS:
2289              ; TRANSLATE TO UPPER CASE
2290 1218 FE7F     CPI    7FH      ;RUBOUT?
2291 121A C8       RZ
2292 121B FE61     CPI    ('A' OR 0100000B) ;UPPER CASE A
2293 121D D8       RC
2294 121E E65F     ANI    1011111B ;CLEAR UPPER CASE BIT
2295 1220 C9       RET
2296              ;

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2297      CMIO:
2298      ; GET NEXT BUFFER CHARACTER FROM CONSOLE W/O TRANSLATION
2299      1221 E5      PUSH    H      ;SAVE FOR REUSE LOCALLY
2300      1222 21051A  LXI      H,CURLN
2301      1225 7E      MOV     A,M
2302      1226 B7      ORA     A      ;ZERO?
2303      1227 3E0B     MVI     A,CR
2304      1229 CA3512  JZ      GNCRET ;RETURN WITH CR IF EXHAUSTED
2305      122C 35      DCR     M      ;CURLN=CURLN-1
2306      122D 2A021A  LHLD    NEXTCOM
2307      1230 7E      MOV     A,M      ;GET NEXT CHARACTER
2308      1231 23      INX     H      ;NEXTCOM=NEXTCOM+1
2309      1232 22021A  SHLD    NEXTCOM ;UPDATED
2310      1235 E1      GNCRET: POP     H      ;RESTORE ENVIRONMENT
2311      1236 C9      RET;
2312      ;
2313      ; *****
2314      ; * * *
2315      ; * DISK I/O ROUTINES *
2316      ; * * *
2317      ; *****
2318      ;
2319      OPN:
2320      ;FILE OPEN ROUTINE. THIS SUBROUTINE OPENS THE DISK INPUT
2321      1237 E5      PUSH    H
2322      1238 D5      PUSH    D
2323      1239 C5      PUSH    B
2324      123A AF      XRA     A
2325      123B 325B00  STA     DBP      ;CLEAR BUFFER POINTER
2326      123E 0E0F     MVI     C,OPF
2327      1240 115C00  LXI     D,DFCB
2328      1243 CDA406  CALL    TRAPAD ;TO BDS
2329      1246 C1      POP     B
2330      1247 D1      POP     D
2331      1248 E1      POP     H
2332      1249 C9      RET
2333      CLOSE:
2334      124A C5      PUSH    B
2335      124B D5      PUSH    D
2336      124C E5      PUSH    H
2337      124D 0E10     MVI     C,16
2338      124F CDA406  CALL    TRAPAD
2339      1252 E1      POP     H
2340      1253 D1      POP     D
2341      1254 C1      POP     B
2342      1255 C9      RET
2343      ;
2344      DWRITE:
2345      ; DISK WRITE ROUTINE
2346      1256 C5      PUSH    B
2347      1257 D5      PUSH    D
2348      1258 E5      PUSH    H
2349      1259 0E15     MVI     C,WRITEF ;WRITE FUNC
2350      125B CDA406  CALL    TRAPAD
2351      125E E1      POP     H
2352      125F D1      POP     D

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2353 1260 C1      POP      B
2354 1261 C9      RET
2355              ;
2356              ;
2357      SETDMA:
2358      ; DMA ADDRESS SET ROUTINE
2359 1262 C5      PUSH     B
2360 1263 D5      PUSH     D
2361 1264 E5      PUSH     H
2362 1265 0E1A    MVI      C,DMAF      ;DMA FUNC #
2363 1267 CDA406  CALL     TRAPAD
2364 126A E1      POP      H
2365 126B D1      POP      D
2366 126C C1      POP      B
2367 126D C9      RET
2368              ;
2369      MAKE:
2370      ;MAKE A FILE
2371 126E C5      PUSH     B
2372 126F D5      PUSH     D
2373 1270 E5      PUSH     H
2374 1271 0E16    MVI      C,22
2375 1273 CDA406  CALL     TRAPAD
2376 1276 E1      POP      H
2377 1277 D1      POP      D
2378 1278 C1      POP      B
2379 1279 C9      RET
2380              ;
2381      DELETE:
2382      ; FILE DELETE ROUTINE
2383 127A C5      PUSH     B
2384 127B D5      PUSH     D
2385 127C E5      PUSH     H
2386 127D 0E13    MVI      C,DELF
2387 127F CDA406  CALL     TRAPAD
2388 1282 E1      POP      H
2389 1283 D1      POP      D
2390 1284 C1      POP      B
2391 1285 C9      RET
2392              ;
2393              ; READ FILES (HEX OR COM)
2394              ;
2395              ;
2396      QTYPE: ;CHECK FOR COMMAND FILE TYPE (COM, HEX, UTL)
2397      ; REGS A,B,C CONTAIN CHARACTERS TO MATCH
2398 1286 216500   LXI      H,FCB+FFTH
2399 1289 BE      CMP      M
2400 128A C0      RNZ              ;RETURN WITH NO MATCH?
2401 128B 78      MOV      A,B      ;MATCHED, CHECK NEXT
2402 128C 23      INX      H      ;NEXT FCB CHAR
2403 128D BE      CMP      M
2404 128E C0      RNZ              ;MATCHED?
2405 128F 79      MOV      A,C      ;YES, GET NEXT CHAR
2406 1290 23      INX      H
2407 1291 BE      CMP      M      ;COMPARE, AND
2408 1292 C9      RET              ;RETURN WITH NZ FLAG IF NO MATCH

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2409      ;
2410      ;
2411      COMLOAD:      ;COMPARE HL > MLOAD
2412      1293 EB      XCHG      ;H,L TO D,E
2413      1294 2A8319  LHL      MLOAD ;MLOAD TO H,L
2414      1297 7D      MOV      A,L      ;MLOAD LSB
2415      1298 93      SUB      E
2416      1299 7C      MOV      A,H
2417      129A 9A      SBB      D      ;MLOAD-OLDHL GENS CARRY IF HL>MLOAD
2418      129B EB      XCHG
2419      129C C9      RET
2420      ;
2421      CKMLOAD:      ;CHECK FOR HL > MLOAD AND SET MLOAD IF SO
2422      129D CD9312  CALL      COMLOAD ;CARRY IF HL>MLOAD
2423      12A0 D0      RNC
2424      12A1 228319  SHLD      MLOAD ;CHANGE IT
2425      12A4 C9      RET
2426      ;
2427      ;
2428      CKDFLD:
2429      12A5 EB      XCHG
2430      12A6 2AA719  LHL      DEFLOAD
2431      12A9 7D      MOV      A,L      ;LSB
2432      12AA 93      SUB      E      ;
2433      12AB 7C      MOV      A,H      ;MSB
2434      12AC 9A      SBB      D      ;IS IT SMALLER?
2435      12AD EB      XCHG
2436      12AE D0      RNC      ;NO CHANGE
2437      12AF 22A719  SHLD      DEFLOAD ;RETURN NEW VALUE
2438      12B2 C9      RET
2439      ;
2440      ;
2441      CHKDIS:      ;CHECK FOR DISASGH PRESENT
2442      12B3 3A8519  LDA      DASH      ;=00 IF PRESENT
2443      12B6 FE01  CPI      1      ;00-1 GENERATES CARRY
2444      12B8 D0      RNC      ;01-1 GENERATES "NO CARRY"
2445      ;      OTHERWISE, CHECK HIGH LOAD ADDRESS
2446      12B9 E5      PUSH      H
2447      12BA 210000  LXI      H,MOBBAS      ;BASE ADDRESS
2448      12BD CD9312  CALL      COMLOAD
2449      12C0 E1      POP      H
2450      12C1 C9      RET
2451      ;
2452      ; PRINT ROUTINES FOR SSCREAN DISPLAY
2453      ;
2454      BLANK:
2455      12C2 3E20      MVI      A,' '
2456      ;
2457      PCHAR: ;PRINT CHARACTER TO CONSOLE
2458      12C4 E5      PUSH      H
2459      12C5 D5      PUSH      D
2460      12C6 C5      PUSH      B
2461      12C7 5F      MOV      E,A
2462      12C8 0E02      MVI      C,CDF
2463      12CA CDA406  CALL      TRAPAD
2464      12CD C1      POP      B

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2465 12CE D1      POP      D
2466 12CF E1      POP      H
2467 12D0 C9      RET
2468              ;
2469              PRMSG: ;PRINT MESSAGE AT HL UNTIL 00 ENCOUNTERED
2470 12D1 7E      MOV      A,M
2471 12D2 B7      ORA      A
2472 12D3 C8      RZ              ;END IF 00 FOUND
2473 12D4 CDC412   CALL     PCHAR ;PRINT THE CURRENT CHAR
2474 12D7 23      INX      H      ;MOVE TO NEXT CHAR
2475 12D8 C3D112   JMP      PRMSG ;FOR ANOTHER CHAR
2476
2477              ;
2478              PNIB: ;PRINT NIBBLE IN LO ACCUM
2479 12DB FE0A      CPI      10
2480 12DD D2E512   JNC      PNIBH ;JUMP IF A-F
2481 12E0 C630      ADI      '0'
2482 12E2 C3C412   JMP      PCHAR ;RET THRU PCHAR
2483 12E5 C637      PNIBH: ADI      'A'-10
2484 12E7 C3C412   JMP      PCHAR
2485              ;
2486 12EA F5      PBYTE: PUSH     PSW      ;SAVE A COPY FOR LO NIBBLE
2487 12EB 1F      RAR
2488 12EC 1F      RAR
2489 12ED 1F      RAR
2490 12EE 1F      RAR
2491 12EF E60F      ANI      0FH      ;MASK HO NIBBLE TO LO NIBBLE
2492 12F1 CDD812   CALL     PNIB
2493 12F4 F1      POP      PSW      ;RECALL BYTE
2494 12F5 E60F      ANI      0FH
2495 12F7 C3DB12   JMP      PNIB
2496              ;
2497              CRLF: ;CARRIAGE RETURN LINE FEED
2498 12FA 3E0D      MVI      A,CR
2499 12FC CDC412   CALL     PCHAR
2500 12FF 3E0A      MVI      A,LF
2501 1301 C3C412   JMP      PCHAR
2502              ;
2503              BREAK: ;CHECK FOR BREAK KEY
2504 1304 C5      PUSH     B
2505 1305 D5      PUSH     D
2506 1306 E5      PUSH     H
2507 1307 0E0B      MVI      C,CHKIO
2508 1309 CDA406      CALL     TRAPAD
2509 130C E601      ANI      1B
2510 130E E1      POP      H
2511 130F D1      POP      D
2512 1310 C1      POP      B
2513 1311 C9      RET
2514              ;
2515              PADDSH: ;PRINT ADDRESS REFERENCE GIVEN BY HL
2516 1312 EB      XCHG
2517              ;
2518              PADDSY: ;PRINT ADDRESS REFERENCE GIVEN BY DE, ALONG
2519              ; WITH SYMBOL AT THAT ADDRESS (IF IT EXISTS)
2520 1313 D5      PUSH     D      ;SAVE THE ADDRESS FOR SYMBOL LOOKUP

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2521 1314 57 XCHG ;READY FOR THE ADDRESS DUMP
2522 1315 C04C13 CALL PADDR ;HEX VALUE PRINTED
2523 1318 D1 POP D ;RECALL SEARCH ADDRESS
2524 1319 3AEF19 LDA NEGCOM ;NEGATED COMMAND?
2525 131C B7 ORA A ;FF?
2526 131D C0 RNZ ;RETURN IF TRUE
2527 131E CD3819 CALL ALOOKUP ;ADDRESS LOOKUP
2528 1321 C8 RZ ;SKIP SYMBOL IF NOT FOUND
2529 ; SYMBOL FOUND, PRINT IT
2530 PRDOTSY:
2531 ;PRINT SYMBOL PRECEDED BY .
2532 1322 CDC212 CALL BLANK
2533 1325 3E2E MVI A,','
2534 1327 CDC412 CALL PCHAR
2535 ;
2536 ; DROP THROUGH TO PRINT SYMBOL
2537 PRSYN:
2538 132A 5E MOV E,M ;GET LENGTH OF SYMBOL
2539 132B 2B PRSYO: DCX H ;TO FIRST/NEXT CHARACTER
2540 132C 7E MOV A,M ;NEXT TO PRINT
2541 132D CDC412 CALL PCHAR ;CHARACTER OUT
2542 1330 1D DCR E ;COUNT LENGTH DOWN
2543 1331 C22B13 JNZ PRSYO
2544 1334 C9 RET ;RETURN TO CALLER
2545 ;
2546 ; ENTER HERE TO PRINT OPTIONAL LABEL AT HL
2547 PRLABEL:
2548 1335 E5 PUSH H ;SAVE ADDRESS
2549 1336 3AEF19 LDA NEGCOM ;NEGATED?
2550 1339 B7 ORA A
2551 133A D1 POP D ;RECALLED IN CASE RETURN
2552 133B C0 RNZ ;CONTINUE IF NOT NEGATED
2553 133C CD3819 CALL ALOOKUP ;DOES THE LABEL EXIST?
2554 133F C8 RZ ;RETURN IF NOT PRESENT
2555 1340 C0FA12 CALL CRLF ;GO TO NEWLINE
2556 1343 CD2A13 CALL PRSYN ;PRINT THE SYMBOL
2557 1346 3E3A MVI A,':'
2558 1348 CDC412 CALL PCHAR ;LABEL:
2559 134B C9 RET
2560 ;
2561 ;
2562 PADDR: ;PRINT THE ADDRESS VALUE IN H,L
2563 134C 7C MOV A,H
2564 134D CDEA12 CALL PBYTE
2565 1350 7D MOV A,L
2566 1351 C3EA12 JMP PBYTE
2567 ;
2568 PGRAPH: ;PRINT GRAPHIC CHARACTER IN REG-A OR ',' IF NOT
2569 1354 FE7F CPI 7FH
2570 1356 D25E13 JNC PPERIOD
2571 1359 FE20 CPI ','
2572 135B D2C412 JNC PCHAR
2573 PPERIOD:
2574 135E 3E2E MVI A,','
2575 1360 C3C412 JMP PCHAR
2576 ;

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2577      DISCON:      ;COMPARE H,L AGAINST DISMAX.  CARRY SET IF HL > DISMAX AND
2578      1363 EB      XCHG
2579      1364 2A6619   LHL    DISMAX
2580      1367 7D      MOV     A,L
2581      1368 93      SUB     E
2582      1369 6F      MOV     L,A      ;REPLACE FOR ZERO TESTS LATER
2583      136A 7C      MOV     A,H
2584      136B 9A      SBB     D
2585      136C EB      XCHG
2586      136D C9      RET
2587      ;
2588      ;
2589      ;      SYDELIM CHECKS FOR / + - CR , OR BLANK
2590      ;      SYSEP  CHECKS FOR  + - CR , OR BLANK
2591      ;      DELIM  CHECKS FOR      CR , OR BLANK
2592      ;
2593      ;
2594      SYDELIM:;CHECK FOR SYMBOL DELIMITER
2595      136E FE2F      CPI     '/'      ;SEPARATOR
2596      1370 C8      RZ
2597      SYSEP: ;SEPARATOR?
2598      1371 FE2B      CPI     '+'
2599      1373 C8      RZ
2600      1374 FE2D      CPI     '-'
2601      1376 C8      RZ
2602      ;
2603      DELIM: ;CHECK FOR DELIMITER CHARACTER
2604      1377 FE0D      CPI     CR
2605      1379 C8      RZ
2606      137A FE2C      CPI     ','
2607      137C C8      RZ
2608      137D FE20      CPI     '.'
2609      137F C9      RET
2610      ;
2611      HEXCON:      ;CONVERT ACCUMULATOR TO PURE BINARY FROM EXTERNAL HEX
2612      1380 D630      SUI     '0'
2613      1382 FE0A      CPI     10
2614      1384 D8      RC      ;MUST BE 0-9
2615      1385 C6F9      ADI     ('0'-'A'+10) AND OFFH
2616      1387 FE10      CPI     16
2617      1389 D8      RC      ;MUST BE 0-15
2618      138A C39410    JMP     CERROR ;BAD HEX DIGIT
2619      ;
2620      GETVAL:      ;GET NEXT EXPRESSION VALUE TO H,L (POINTER IN D,E ASSUMED)
2621      138D EB      XCHG
2622      138E 5E      MOV     E,H
2623      138F 23      INX     H
2624      1390 56      MOV     D,H
2625      1391 23      INX     H
2626      1392 EB      XCHG
2627      1393 C9      RET
2628      ;
2629      GETSYMV:
2630      ;LOOKUP SYMBOL PRECEDED BY =, @, OR . OPERATOR
2631      1394 D5      PUSH    D      ;SAVE NEXT TO FILL IN ADDRESS VECTOR
2632      1395 CD1512    CALL    GNC    ;READ THE NEXT CHARACTER

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2633 1398 2A8119      LHL D    SYTOP    ;HL IS BEGINNING OF SEARCH
2634 139B F5          GETSYO:  PUSH   PSW      ;SAVE FIRST CHARACTER
2635 139C 4E          MOV     C,M      ;LENGTH OF CURRENT SYMBOL
2636 139D 79          MOV     A,C      ;TO A FOR END OF SEARCH CHECK
2637 139E FE10        CPI     16      ;LENGTH 16 OR MORE ENDS SEARCH
2638 13A0 D29410      JNC     CERROR  ;? ERROR IF NOT THERE
2639 13A3 F1          POP     PSW      ;RECALL FIRST CHARACTER
2640 13A4 EB          XCHG     ;SYMBOL ADDRESS TO DE
2641 13A5 D5          PUSH    D        ;SAVE SEARCH ADDRESS
2642 13A6 F5          PUSH    PSW      ;SAVE CHARACTER
2643 13A7 2A021A      LHL D    NEXTCOM ;NEXT BUFFER POSITION
2644 13AA E5          PUSH    H        ;SAVED TO MEMORY
2645 13AB 2A041A      LHL D    COMLEN  ;COMLEN AND CURLN
2646 13AE E5          PUSH    H        ;SAVE TO MEMORY
2647                ;      STACKED: CURLN/NEXTCOM/CHAR/SYMADDR
2648 13AF EB          XCHG     ;DE IS NEXT TO MATCH+1
2649 13B0 0C          INR     C        ;COUNT+1
2650                SYCHAR:  ;CHECK NEXT CHARACTER
2651 13B1 CD6E13      CALL    SYDELIM ;/, COMMA, CR, OR SPACE?
2652 13B4 CAC613      JZ      SYDEL   ;STOP SCAN IF SO
2653                ;      NOT A DELIMITER IN THE INPUT, END OF SYMBOL?
2654 13B7 0D          DCR     C        ;COUNT=COUNT-1
2655 13B8 CAE013      JZ      SYNXT   ;SKIP TO NEXT SYMBOL IF SO
2656                ;      NOT END OF SYMBOL, CHECK FOR MATCH
2657 13BB 2B          DCX     H        ;NEXT SYMBOL ADDRESS
2658 13BC BE          CMP     M        ;SAME?
2659 13BD C2E013      JNZ     SYNXT   ;SKIP IF NOT
2660 13C0 CD1512      CALL    GNC      ;OTHERWISE, GET NEXT INPUT CHARACTER
2661 13C3 C3B113      JMP     SYCHAR  ;FOR ANOTHER MATCH ATTEMPT
2662                ;
2663                SYDEL:  ;DELIMITER FOUND, COUNT SHOULD GO TO ZERO
2664 13C6 0D          DCR     C
2665 13C7 C2E013      JNZ     SYNXT   ;SKIP SYMBOL IF NOT
2666                ;
2667                ;      SYMBOL MATCHED, RETURN SYMBOL'S VALUE
2668 13CA E1          POP     H        ;DISCARD COMLEN
2669 13CB E1          POP     H        ;DISCARD NEXTCOM
2670 13CC E1          POP     H        ;DISCARD FIRST CHARACTER
2671 13CD CD7113      CALL    SYSEP   ;+ - CR, COMMA, OR SPACE? (NOT / TEST)
2672 13D0 CAD913      JZ      SYLOC   ;RETURN IF NOT A / AT END
2673 13D3 CD1512      CALL    GNC      ;REMOVE THE / AND CONTINUE THE SCAN
2674 13D6 C3E913      JMP     SYNXT0  ;FOR ANOTHER SYMBOL
2675                ;
2676                ;      END OF INPUT, GET VALUE TO DE
2677 13D9 E1          SYLOC:  POP     H        ;RECALL SYMBOL ADDRESS
2678 13DA 23          INX     H        ;TO LOW ADDRESS
2679 13DB 5E          MOV     E,M      ;LOW ADDRESS TO DE
2680 13DC 23          INX     H        ;TO HIGH ADDRESS
2681 13DD 56          MOV     D,M      ;TO D
2682 13DE E1          POP     H        ;RE-INSTATE HL
2683 13DF C9          RET            ;WITH DE=VALUE, HL=NEXT TO FILL
2684                ;
2685                ;
2686                SYNXT:  ;MOVE TO THE NEXT SYMBOL
2687 13E0 E1          POP     H        ;COMLEN
2688 13E1 22041A      SHLD    COMLEN  ;RESTORED

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2689 13E4 E1      POP      H      ;NEXTCOM
2690 13E5 22021A  SHLD     NEX/COM ;RESTORED
2691 13E8 F1      POP      PSW     ;FIRST CHARACTER TO A
2692 13E9 E1      SYNXT0:  POP      H      ;SYMBOL ADDRESS
2693 13EA F5      PUSH     PSW     ;SAVE FIRST CHARACTER
2694 13EB 7E      MOV      A,M     ;SYMBOL LENGTH
2695 13EC 2F      CMA      ;1'S COMPLEMENT OF LENGTH
2696 13ED 85      ADD      L      ;HL=HL-LENGTH-1
2697 13EE 8F      MOV      L,A
2698 13EF 3EFF     MVI      A,OFFH ;EXTEND SIGN OF LENGTH
2699 13F1 8C      ADC      H      ;HIGH ORDER BITS
2700 13F2 67      MOV      H,A     ;NOW MOVE PAST ADDRESS FIELD
2701 13F3 2B      DCX      H      ;-1
2702 13F4 2B      DCX      H      ;TOTAL IS: HL=HL-LENGTH-3
2703 13F5 F1      POP      PSW     ;RECALL FIRST CHARACTER
2704 13F6 C39B13  JMP      GETSY0 ;FOR ANOTHER SEARCH
2705
2706
2707
2708
2709 13F9 EB      XCHG                     ;NEXT TO FILL IN DE
2710 13FA 210000  LXI      H,0      ;READY TO ACCUMULATE VALUE
2711 13FD FE2E    CPI      '.'    ;ADDRESS REFERENCE?
2712 13FF CA9413  JZ      GETSYMV ;RETURN THROUGH GETSYMV
2713 1402 FE40    CPI      '@'    ;VALUE REFERENCE?
2714 1404 C21114 JNZ      GETOPERO ;SKIP IF NOT
2715 1407 CD9413 CALL     GETSYMV ;ADDRESS TO DE
2716 140A E5      PUSH     H      ;SAVE NEXT TO FILL
2717 140B EB      XCHG                     ;ADDRESS OF DOUBLE PREC VALUE TO HL
2718 140C 5E      MOV      E,M
2719 140D 23      INX      H
2720 140E 56      MOV      D,M     ;DOUBLE VALUE TO DE
2721 140F E1      POP      H      ;RESTORE NEXT TO FILL
2722 1410 C9      RET                     ;WITH DE=VALUE, HL=NEXT TO FILL
2723
2724 1411 FE3D     CPI      '='    ;BYTE REFERENCE?
2725 1413 C22014 JNZ      GETOPERO1 ;SKIP IF NOT
2726
2727 1416 CD9413 CALL     GETSYMV ;DE = ADDRESS, HL = NEXT TO FILL
2728 1419 E5      PUSH     H      ;SAVE HL
2729 141A EB      XCHG                     ;OPERAND ADDRESS TO HL
2730 141B 5E      MOV      E,M     ;GET BYTE VALUE
2731 141C 1600     MVI      D,0     ;HIGH BYTE IS ZERO
2732 141E E1      POP      H      ;RESTORE NEXT TO FILL
2733 141F C9      RET                     ;WITH DE=VALUE, HL=NEXT TO FILL
2734
2735
2736
2737 1420 FE27     CPI      '""'    ;START OF STRING?
2738 1422 C24414 JNZ      GETOPERO2
2739
2740 1425 EB      XCHG                     ;RETURN 0000 TO DE, NEXT TO FILL TO HL
2741
2742 1426 CD2112 CALL     GNLC     ;INSIDE QUOTED STRING
2743 1429 FE20     CPI      ''     ;MUST BE GRAPHIC
2744 142B DA9410 JC      CERR0R ;OTHERWISE REPORT ERROR

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2745 CHARACTER IS GRAPHIC, CHECK FOR EMBEDDED QUOTES
2746 142E FE27 CPI '""'
2747 1430 C23F14 JNZ GETSTR1 ;SKIP IF NOT
2748 ; MUST BE EMBEDDED QUOTE OR END OF STRING
2749 1433 CD2112 CALL GNLC ;CHARACTER FOLLOWING QUOTE
2750 1436 CD7113 CALL SYSEP ;SYMBOL SEPARATOR?
2751 1439 C8 RZ ;RETURN WITH VALUE IN DE
2752 ; OTHERWISE THE SYMBOL IS NOT A SEPARATOR, MUST BE QUOTE
2753 143A FE27 CPI '""'
2754 143C C29410 JNZ CERROR ;REPORT ERROR IF NOT
2755 GETSTR1:
2756 ;STORE THE ASCII CHARACTER INTO LOW ORDER DE
2757 143F 53 MOV D,E ;LOW CHARACTER TO HIGH CHARACTER
2758 1440 5F MOV E,A ;LOW CHARACTER FROM ACCUMULATOR
2759 1441 C32614 JMP GETSTRO ;FOR ANOTHER CHARACTER SCAN
2760 ;
2761 GETOPER2:
2762 ;CHECK FOR DECIMAL INPUT
2763 1444 FE23 CPI '#'
2764 1446 C26814 JNZ GETOPER3 ;MUST BE HEX
2765 ; DECIMAL INPUT, CONVERT
2766 GETDECO:
2767 1449 CD1512 CALL GNC ;GET NEXT DIGIT
2768 144C CD7113 CALL SYSEP ;SEPARATOR?
2769 144F CA6614 JZ GETDEC1 ;SKIP TO END IF SO
2770 1452 D630 SUI '0' ;DECIMAL DIGIT?
2771 1454 FE0A CPI 10
2772 1456 D29410 JNC CERROR ;ERROR IF ABOVE 9
2773 1459 29 DAD H ;HL=HL*2
2774 145A 44 MOV B,H ;SAVE HIGH ORDER
2775 145B 4D MOV C,L ;SAVE LOW ORDER
2776 145C 29 DAD H ;*4
2777 145D 29 DAD H ;*8
2778 145E 09 DAD B ;*10
2779 145F 4F MOV C,A ;READY TO ADD DIGIT
2780 1460 0600 MVI B,0
2781 1462 09 DAD B ;DIGIT ADDED TO HL
2782 1463 C34914 JMP GETDECO ;FOR ANOTHER DIGIT
2783 ;
2784 GETDEC1:
2785 1466 EB XCHG
2786 1467 C9 RET ;WITH DE=VALUE
2787 ;
2788 GETOPER3:
2789 1468 FE5E CPI '^' ;STACKED VALUE?
2790 146A C27F14 JNZ GETOPER4 ;SKIP IF NOT
2791 ;
2792 ; GET STACKED VALUE
2793 146D 05 PUSH D ;SAVE NEXT TO FILL
2794 146E 2A721A LHLD SLOC ;STACK POINTER
2795 1471 5E GETSTK: MOV E,M
2796 1472 23 INX H
2797 1473 56 MOV D,M ;DE IS STACKED VALUE
2798 1474 23 INX H ;IN CASE ANOTHER ^
2799 1475 CD1512 CALL GNC ;GET ANOTHER CHAR
2800 1478 FE5E CPI '^' ;^ ... ^

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2801 147A CA7114      JZ      GETSTK
2802 147D E1          POP      H      ;DE=VALUE, HL=NEXT TO FILL
2803 147E C9          RET          ;WITH VALUE IN DE
2804                  ;
2805 GETOPER4:
2806                  ; NOT ,, @, =, OR ', MUST BE NUMERIC
2807 147F CD8013      CALL     HEXCON
2808 1482 29          DAD      H      ;*2
2809 1483 29          DAD      H      ;*4
2810 1484 29          DAD      H      ;*8
2811 1485 29          DAD      H      ;*16
2812 1486 B5          ORA      L      ;HL=HL+HEX
2813 1487 6F          MOV      L,A
2814 1488 CD1512      CALL     GNC
2815 148B CD7113      CALL     SYSEP ;DELIMITER?
2816 148E C26814      JNZ      GETOPER3
2817 1491 EB          XCHG
2818 1492 C9          RET
2819                  ;
2820 SCSTORE:          ;STORE D,E TO H,L AND INCREMENT ADDRESS
2821 1493 EB          XCHG
2822 1494 22CC19      SHLD     LASTEXP ;SAVE AS "LAST EXPRESSION"
2823 1497 EB          XCHG
2824 1498 73          MOV      H,E
2825 1499 23          INX      H
2826 149A 72          MOV      H,D
2827 149B 23          INX      H
2828 149C E5          PUSH     H
2829 149D 21FB19      LXI      H,EXPLIST
2830 14A0 34          INR      H      ;COUNT NUMBER OF EXPN'S
2831 14A1 E1          POP      H
2832 14A2 C9          RET
2833                  ;
2834 GETEXP:
2835                  ;SCAN THE NEXT EXPRESSION WITH EMBEDDED +,- SYMBOLS
2836 14A3 FE2D      CPI      '-' ;LEADING MINUS?
2837 14A5 C2AE14      JNZ      GETEXPP ;SKIP TO NEXT IF NOT
2838 14A8 110000      LXI      D,0 ;ASSUME A STARTING 0, WITH FOLLOWING MINUS
2839 14AB C3D414      JMP      GETEXP2 ;TO CONTINUE WITH THE SCAN
2840                  ;
2841 GETEXPP:
2842                  ;CHECK FOR LEADING + OPERATOR
2843 14AE FE2B      CPI      '+'
2844 14B0 C2BB14      JNZ      GETEXP0 ;TO CONTINUE THE SCAN
2845                  ; LEADING + FOUND, USE LAST EXPRESSION
2846 14B3 EB          XCHG      ;DE=HL
2847 14B4 2ACC19      LHL      LASTEXP ;LAST EXPRESSION TO HL
2848 14B7 EB          XCHG      ;THEN TO DE
2849 14B8 C3C314      JMP      GETPLUS ;HANDLE THE PLUS OPERATOR
2850 GETEXP0:
2851                  ;SCAN NEXT ITEM
2852 14BB CDF913      CALL     GETOPER ;VALUE TO DE
2853 GETEXP0:
2854                  ;GET EXPRESSION OPERATOR
2855 14BE FE2B      CPI      '+' ;STOPPED ON +?
2856 14C0 C2D114      JNZ      GETEXP1 ;SKIP TO NEXT TEST IF NOT

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2857      ;      + DELIMITER FOUND, SCAN FOLLOWING OPERAND
2858      GETPLUS:
2859      14C3 D5      PUSH    D      ;SAVE CURRENT VALUE
2860      14C4 CD1512   CALL     GNC    ;SCAN PAST THE +
2861      14C7 CDF913   CALL     GETOPER ;NEXT VALUE TO DE
2862      14CA C1       POP     B      ;RECALL PREVIOUS VALUE
2863      14CB EB       XCHG     ;NEXT VALUE TO HL
2864      14CC 09       DAD     B      ;SUM IN HL
2865      14CD EB       XCHG     ;BACK TO POSITION
2866      14CE C3BE14   JMP     GETEXPO ;TO TEST FOR FOLLOWING OPERAND
2867      ;
2868      GETEXP1:
2869      ;NOT A +, CHECK FOR - OPERATOR
2870      14D1 FE2D     CPI     '-'
2871      14D3 C0       RNZ     ;RETURN WITH DELIMITER IN A IF NOT
2872      ;      - DELIMITER FOUND
2873      GETEXP2:
2874      14D4 CD1512   CALL     GNC    ;TO CLEAR THE OPERATOR
2875      14D7 D5       PUSH    D      ;SAVE CURRENT VALUE
2876      14D8 CDF913   CALL     GETOPER ;TO GET THE NEXT VALUE
2877      14DB C1       POP     B      ;RECALL ORIGINAL VALUE TO BC
2878      14DC F5       PUSH    PSW    ;SAVE CHARACTER
2879      14DD 79       MOV     A,C    ;LOW BYTE TO A
2880      14DE 93       SUB     E      ;DIFF IN LOW BYTES
2881      14DF 5F       MOV     E,A    ;BACK TO E
2882      14E0 78       MOV     A,B    ;HIGH BYTE TO A
2883      14E1 9A       SBB     D      ;DIFF IN HIGH BYTES
2884      14E2 57       MOV     D,A    ;BACK TO DE
2885      14E3 F1       POP     PSW    ;RESTORE NEXT CHARACTER
2886      14E4 C3BE14   JMP     GETEXPO ;FOR THE REMAINDER OF THE EXPRESSION
2887
2888      ;
2889      ;
2890      ;      SUBROUTINES FOR CPU STATE DISPLAY
2891      FLGSHF:      ;SHIFT COMPUTATION FOR FLAG GIVEN BY REG-B
2892      ;      REG A CONTAINS FLAG UPON EXIT (UNSHIFTED)
2893      ;      REG C CONTAINS NUMBER OF SHIFTS REQUIRED+1
2894      ;      REGS D,E CONTAIN ADDRESS OF FLAGS IN TEMPLATE
2895      14E7 E5       PUSH    H
2896      14E8 214916   LXI     H,FLGTAB ;SHIFT TABLE
2897      14EB 58       MOV     E,B
2898      14EC 1600     MVI     D,0
2899      14EE 19       DAD     D
2900      14EF 4E       MOV     C,M    ;SHIFT COUNT TO C
2901      14F0 21701A   LXI     H,FLOC  ;ADDRESS OF FLAGS
2902      14F3 7E       MOV     A,M    ;TO REG A
2903      14F4 EB       XCHG     ;SAVE ADDRESS
2904      14F5 E1       POP     H
2905      14F6 C9       RET
2906      ;
2907      GETFLG:      ;GET FLAG GIVEN BY REG-B TO REG-A AND MASK
2908      14F7 CDE714   CALL     FLGSHF ;BITS TO SHIFT IN REG-A
2909      14FA 0D       GETFLO:      DCR     C
2910      14FB CA0215   JZ      GETFL1
2911      14FE 1F       RAR
2912      14FF C3FA14   JMP     GETFLO

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2913 1502 E601 GETFL1: ANI 1B
2914 1504 C9 RET
2915 ;
2916 GETDBA: ;GET DOUBLE BYTE ADDRESS CORRESPONDING TO REG-A TO HL
2917 1505 D606 SUI BVAL ;NORMALIZE TO 0,1,...
2918 1507 214416 LXI H,RINX ;INDEX TO STACKED VALUES
2919 150A 5F MOV E,A ;INDEX TO E
2920 150B 1600 MVI D,0 ;DOUBLE PRECISION
2921 150D 19 DAD D ;INDEXED INTO VECTOR
2922 150E 5E MOV E,M ;OFFSET TO E
2923 150F 16FF MVI D,OFFH ;-1
2924 1511 21781A LXI H,STACK
2925 1514 19 DAD D ;HL HAS BASE ADDRESS
2926 1515 C9 RET
2927 ;
2928 GETDBL: ;GET DOUBLE BYTE CORRESPONDING TO REG-A TO HL
2929 1516 CD0515 CALL GETDBA ;ADDRESS OF ELT IN HL
2930 1519 5E MOV E,M ;LSB
2931 151A 23 INX H
2932 151B 56 MOV D,M ;MSB
2933 151C EB XCHG ;BACK TO HL
2934 151D C9 RET
2935 ;
2936 DELT: ;DISPLAY CPU ELEMENT GIVEN BY COUNT IN REG-B, ADDRESS IN H,L
2937 151E 78 MOV A,B ;GET COUNT
2938 151F FE05 CPI AVAL ;PAST A?
2939 1521 D23115 JNC DELTO ;JMP IF NOT FLAG
2940 ;
2941 ; DISPLAY FLAG
2942 1524 CDF714 CALL GETFLG ;FLAG TO REG-A
2943 1527 B7 ORA A ;FLAG=0?
2944 1528 3E2D MVI A,'-' ;FOR FALSE DISPLAY
2945 152A CAC412 JZ PCHAR ;RETURN THROUGH PCHAR
2946 152D 7E MOV A,M ;OTHERWISE GET THE CHARACTER
2947 152E C3C412 JMP PCHAR ;PRINT THE FLAG NAME IF TRUE
2948 ;
2949 DELTO: ;NOT FLAG, DISPLAY X= AND DATA
2950 1531 F5 PUSH PSW
2951 1532 7E MOV A,M
2952 1533 CDC412 CALL PCHAR ;REGISTER NAME
2953 1536 3E3D MVI A,'='
2954 1538 CDC412 CALL PCHAR
2955 153B F1 POP PSW
2956 153C C24715 JNZ DELT1 ;JUMP IF NOT REG-A
2957 ;
2958 ; REGISTER A, DISPLAY BYTE VALUE
2959 153F 21711A LXI H,ALOC
2960 1542 7E MOV A,M
2961 1543 CDEA12 CALL PBYTE
2962 1546 C9 RET
2963 ;
2964 DELT1: ;DOUBLE BYTE DISPLAY
2965 1547 CD1615 CALL GETDBL ;TO H,L
2966 154A CD4C13 CALL PADDR ;PRINTED
2967 154D C9 RET
2968 ;

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2969          ;DSTATE:      ;DISPLAY CPU STATE
2970 154E CDF12      CALL    CRLF      ;NEW LINE
2971 1551 CDC212     CALL    BLANK     ;SINGLE BLANK
2972 1554 213916     LXI     H,RVCT    ;REGISTER VECTOR
2973 1557 0600       MVI     B,0       ;REGISTER COUNT
2974 1559 C5        DSTAO: PUSH    B
2975 155A E5         PUSH    H
2976 155B CD1E15     CALL    DELT     ;ELEMENT DISPLAYED
2977 155E E1         POP     H        ;RVCT ADDRESS RESTORED
2978 155F C1         POP     B        ;COUNT RESTORED
2979 1560 04        INR     B        ;NEXT COUNT
2980 1561 23        INX     H        ;NEXT REGISTER
2981 1562 78        MOV     A,B      ;LAST COUNT?
2982 1563 FE0B      CPI     FVAL+1
2983 1565 D27315     JNC     DSTA1    ;JMP IF PAST END
2984 1568 FE05      CPI     AVAL     ;BLANK AFTER?
2985 1569 DA5915     JC      DSTAO
2986          ; YES, BLANK AND GO AGAIN
2987 156D CDC212     CALL    BLANK
2988 1570 C35915     JMP     DSTAO
2989          ;
2990          ; READY TO SEND DECODED INSTRUCTION
2991 DSTA1:
2992 1573 CDC212     CALL    BLANK
2993 1576 CDF317     CALL    NBRK     ;COMPUTE BREAKPOINTS IN CASE OF TRACE
2994 1579 F5        PUSH    PSW      ;SAVE EXPRESSION COUNT - B,C AND D,E HAVE BPTS
2995 157A D5        PUSH    D        ;SAVE BP ADDRESS
2996 157B C5        PUSH    B        ;SAVE AUX BREAKPOINT
2997 157C CDB312     CALL    CHKDIS   ;CHECK TO SEE IF DISASSEMBLER IS HERE
2998 157F D29315     JNC     DCHEX    ;DISPLAY HEX IF NOT
2999          ; DISASSEMBLE CODE
3000 1582 2A761A     LHLD    PLOC     ;GET CURRENT PC
3001 1585 220C00     SHLD    DISPC    ;SET DISASSM PC
3002 1588 211000     LXI     H,DISPG;PAGE MODE = OFFH TO TRACE
3003 158B 36FF      MVI     M,OFFH
3004 158D CD0600     CALL    DISEN
3005 1590 C3B815     JMP     DSTRET
3006          ;
3007          DCHEX: ;DISPLAY HEX
3008 1593 2B        DCX     H        ;POINT TO LAST TO WRITE
3009 1594 226619     SHLD    DISMAX   ;SAVE FOR COMPARE BELOW
3010 1597 2A761A     LHLD    PLOC     ;START ADDRESS OF TRACE
3011 159A 7E        MOV     A,M      ;GET OPCODE
3012 159B CDEA12     CALL    PBYTE
3013 159E 23        INX     H        ;READY FOR NEXT BYTE
3014 159F CD6313     CALL    DISCOM   ;ZERO SET IF ONE BYTE TO PRINT, CARRY IF NO MORE
3015 15A2 DAB815     JC      DSTRET
3016 15A5 F5        PUSH    PSW      ;SAVE RESULT OF ZERO TEST
3017 15A6 CDC112     CALL    BLANK     ;SEPARATOR
3018 15A9 F1        POP     PSW      ;RECALL ZERO TEST
3019 15AA B3        ORA     E        ;ZERO TEST
3020 15AB CAB715     JZ      DSTA2
3021          ; DISPLAY DOUBLE BYTE
3022 15AE 5E        MOV     E,M
3023 15AF 23        INX     H
3024 15B0 56        MOV     D,M

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3025 15B1 CD1313      CALL  PADDY  ;PRINT ADDRESS
3026 15B4 C3BB15      JMP     DSTRET
3027                  ;
3028                  DSTA2: ;PRINT BYTE VALUE
3029 15B7 7E          MOV     A,M
3030 15B8 CDEA12      CALL  PBYTE
3031                  DSTRET:
3032                  ; NOW PRINT SYMBOL FOR THIS INSTRUCTION IF IMPLIED MEMORY OP
3033 15BB 2A761A      LHL     PLOC  ;INSTRUCTION LOCATION
3034 15BE 7E          MOV     A,M  ;INSTRUCTION TO A REGISTER
3035 15BF 47          MOV     B,A  ;COPY TO B REGISTER
3036                  ; CHECK FOR ADC, ADD, ANA, CMP, ORA, SBB, SUB, XRA M
3037 15C0 E6C0      ANI     1100$0000B  ;HIGH ORDER BITS 11?
3038 15C2 FE80      CPI     1000$0000B  ;CHECK
3039 15C4 C2D215      JNZ     NOTACC
3040                  ; FOUND ACC-REG OPERATION, INVOLVING MEMORY?
3041 15C7 78          MOV     A,B  ;RESTORE OP CODE
3042 15C8 E607      ANI     0000$0111B
3043 15CA FE06      CPI     6      ;MEMORY = 6
3044 15CC C23516      JNZ     DISREST ;SKIP TO RESTORE REGISTERS IF NOT
3045 15CF C3FF15      JMP     DISMEM  ;TO DISPLAY SYMBOL
3046                  ;
3047                  NOTACC: ;NOT AN ACCUMULATOR OPERATION, CHECK FOR MOV X,M OR M,X
3048 15D2 FE40      CPI     0100$0000B  ;MOV OPERATION?
3049 15D4 C2EF15      JNZ     NOTMOV
3050 15D7 78          MOV     A,B  ;MOV OPERATION OR HALT
3051 15D8 FE76      CPI     HLT  ;SKIP HALT TEST
3052 15DA CA3516      JZ      DISREST ;TO SKIP TESTS
3053 15DD E607      ANI     111B  ;MOVE FROM MEMORY?
3054 15DF FE06      CPI     6
3055 15E1 CA0B16      JZ     DISHL  ;SKIP TO PRINT HL IF SO
3056                  ; NOT MOVE FROM MEMORY, MOVE TO MEMORY?
3057 15E4 78          MOV     A,B  ;RESTORE OPERATION CODE
3058 15E5 E638      ANI     111000B ;SELECT HIGH ORDER REGISTER
3059 15E7 FE30      CPI     6 SHL 3 ;CHECK FOR MEMORY OP
3060 15E9 C23516      JNZ     DISREST ;SKIP TO RESTORE IF NOT
3061 15EC C30B16      JMP     DISHL  ;TO DISPLAY HL REGISTER
3062                  ;
3063                  NOTMOV: ;NOT A MOVE OPERATION, CHECK FOR MVI M
3064 15EF 78          MOV     A,B  ;RESTORE OPERATION CODE
3065 15F0 FE36      CPI     0011$0110B  ;MVI M,XX?
3066 15F2 CA0B16      JZ     DISHL  ;DISPLAY HL ADDRESS IF SO
3067                  ; NOW LOOK FOR INR M, DCR M
3068 15F5 FE34      CPI     0011$0100B  ;INR M?
3069 15F7 CAFF15      JZ     DISMEM  ;SKIP TO PRINT HL IF SO
3070 15FA FE35      CPI     0011$0101B  ;DCR M?
3071 15FC C21116      JNZ     NOTIDCR ;SKIP IF NOT INR / DCR M
3072                  DISMEM: ;DISPLAY MEMORY VALUE FIRST
3073 15FF 3E3D      MVI     A,'='
3074 1601 CDC412      CALL  PCHAR
3075 1604 2A741A      LHL     HLOC
3076 1607 7E          MOV     A,M
3077 1608 CDEA12      CALL  PBYTE
3078                  ;
3079                  DISHL: ;DISPLAY THE HL SYMBOL, IF IT EXISTS
3080 160B 2A741A      LHL     HLOC

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3081 160E C32416      JMP      DISSYM ;TO RETRIEVE THE SYMBOL
3082                  ;
3083                  NOTIDCR:
3084                  ;CHECK FOR LDAX/STAX B/D
3085 1611 E6E7          ANI      1110$0111B      ;LDAX = 000 X1 010
3086 1613 FE02          CPI      0000$0010B      ;STAX = 000 X0 010
3087 1615 C23516        JNZ      DISREST          ;SKIP IF NOT
3088 1618 78            MOV      A,B              ;LDAX/STAX, GET REGISTER
3089 1619 E610          ANI      0001$0000B      ;GET THE B REGISTER BIT
3090 161B 2A6C1A        LHLD     DLOC
3091 161E C22416        JNZ      DISSYM          ;SKIP TO DISPLAY
3092 1621 2A6E1A        LHLD     BLOC          ;DISPLAY B INSTEAD
3093                  DISSYM: ;ENTER HERE WITH THE HL REGISTER SET TO SYMBOL LOCATION
3094 1624 3AEF19        LDA      NEGCOM ;NEGATED?
3095 1627 B7            ORA      A
3096 1628 C23516        JNZ      DISREST ;FORGET IT.
3097 162B EB            XCHG          ;SEARCH ADDRESS TO DE
3098 162C CD3819        CALL     ALOOKUP ;ZERO SET IF NOT FOUND
3099 162F CA3516        JZ       DISREST ;RESTORE IF NOT FOUND
3100 1632 CD2213        CALL     PRDOTSY ;.SYMBOL PRINTED
3101                  ; DROP THROUGH TO RESTORE THE REGISTERS
3102                  DISREST:
3103 1635 C1            POP      B      ;AUX BREAKPOINT
3104 1636 D1            POP      D      ;RESTORE BREAKPOINT
3105 1637 F1            POP      PSW   ;RESTORE COUNT
3106 1638 C9            RET
3107                  ;
3108                  ; DATA VECTORS FOR CPU DISPLAY
3109 1639 435A4D4549RVECT: DB      'CZMEIABDHSP'
3110 1644 F6            RINX: DB      (BLOC-STACK) AND OFFH ;LOCATION OF BC
3111 1645 F4            DB      (DLOC-STACK) AND OFFH ;LOCATION OF DE
3112 1646 FC            DB      (HLOC-STACK) AND OFFH ;LOCATION OF HL
3113 1647 FA            DB      (SLOC-STACK) AND OFFH ;LOCATION OF SP
3114 1648 FE            DB      (PLOC-STACK) AND OFFH ;LOCATION OF PC
3115                  ; FLGTAB ELEMENTS DETERMINE SHIFT COUNT TO SET/EXTRACT FLAGS
3116 1649 0107080305FLGTAB: DB      1,7,8,3,5 ;CY, ZER, SIGN, PAR, IDCY
3117                  ;
3118                  CLRTRACE: ;CLEAR THE TRACE FLAG
3119 164E 210000          LXI      H,0
3120 1651 22AC19          SHLD     TRACER
3121 1654 AF            XRA      A ;CLEAR ACCUMULATOR
3122 1655 32A919          STA      TMODE ;CLEAR TRACE MODE
3123 1658 C9            RET
3124                  ;
3125                  BREAKP: ;ARRIVE HERE WHEN PROGRAMMED BREAK OCCURS
3126 1659 F3            DI
3127 165A 22741A          SHLD     HLOC ;HL SAVED
3128 165D E1            POP      H ;RECALL RETURN ADDRESS
3129 165E 2B            DCX      H ;DECREMENT FOR RESTART
3130 165F 22761A          SHLD     PLOC
3131                  ; DAD SP BELOW DESTROYS CY, SO SAVE AND RECALL
3132 1662 F5            PUSH     PSW ;INTO USER'S STACK
3133 1663 210200          LXI      H,2 ;BIAS SP BY 2 BECAUSE OF PUSH
3134 1666 39            DAD      SP ;SP IN HL
3135 1667 F1            POP      PSW ;RESTORE CY AND FLAGS
3136 1668 31741A          LXI      SP,STACK-4;LOCAL STACK

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3137 166B E5      PUSH    H      ;SP SAVED
3138 166C F5      PUSH    PSW
3139 166D C5      PUSH    B
3140 166E D5      PUSH    D
3141              ; MACHINE STATE SAVED, CLEAR BREAK POINTS
3142 166F FB      EI            ;IN CASE INTERRUPT DRIVEN IO
3143 1670 2A761A   LHLD    PLOC   ;CHECK FOR RST INSTRUCTION
3144 1673 7E      MOV     A,M     ;OPCODE TO A
3145 1674 FEFF     CPI     RSTIN
3146              ; SAVE CONDITION CODES FOR LATER TEST
3147 1676 F5      PUSH    PSW
3148              ; SAVE PLOC FOR LATER INCREMENT OR DECREMENT
3149 1677 E5      PUSH    H
3150              ;
3151              ; CLEAR ANY PERMANENT BREAK POINTS
3152              ;
3153              ; CHECK FOR AUTO 'U' COMMAND FROM PERM BREAK PASS
3154 1678 3A7419   LDA     PBCNT   ;=00 IF NO AUTO U IN EFFECT
3155 167B 326C19   STA     AUTOU   ;HOLD THIS CONDITION IN AUTO U
3156              ;
3157              ; PERMANENT BREAKS MAY BE ACTIVE, CLEAR THEM
3158              ;
3159 167E 21EB19   LXI     H,PBTABLE+(PBSIZE-1)*PBELT ;SET TO LAST ELT
3160 1681 0E08     MVI     C,PBSIZE ;NUMBER OF ELEMENTS
3161              RESPER0:
3162 1683 E5      PUSH    H      ;SAVE ELEMENT ADDRESS
3163 1684 7E      MOV     A,M     ;(COUNT)
3164 1685 B7      ORA     A      ;SET FLAGS
3165 1686 CA9016   JZ      RESPER1 ;SKIP IF NOT IN USE
3166 1689 23      INX     H      ;TO NEXT ADDRESS
3167 168A 5E      MOV     E,M     ;LOW(ADDR)
3168 168B 23      INX     H
3169 168C 56      MOV     D,M     ;HIGH(ADDR)
3170 168D 23      INX     H
3171 168E 7E      MOV     A,M     ;DATA TO SET AT ADDR
3172 168F 12      STAX    D      ;DATA BACK TO MEMORY
3173              RESPER1:
3174 1690 E1      POP     H      ;BASE OF ELEMENT
3175 1691 11FCFF   LXI     D,-PBELT ;ELEMENT SIZE
3176 1694 19      DAD     D      ;ADDRESSING PREVIOUS ELEMENT
3177 1695 0D      DCR     C      ;COUNT TABLE DOWN
3178 1696 C28316   JNZ     RESPER0 ;FOR ANOTHER ELEMENT
3179              ;
3180              ; DROP THROUGH WHEN WE HAVE REPLACED ALL ELEMENTS,
3181              ; NOW CHECK FOR AN 'AUTO U' COMMAND FROM THE LAST
3182              ; PERMANENT BREAK POINT BYPASS
3183 1699 CDE517   CALL    RESPBC ;RESTORE PBCNT
3184              ;
3185              CLERGO:
3186              ; CLEAR 'GO' BREAKPOINTS WHICH ARE PENDING
3187 169C 21F419   LXI     H,BREAKS
3188 169F 7E      MOV     A,M
3189 16A0 3600     MVI     M,0     ;SET TO ZERO BREAKS
3190 16A2 B7      CLER0: ORA     A      ;ANY MORE?
3191 16A3 CAB316   JZ      CLER1
3192 16A6 3D      DCR     A

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3193 16A7 47      MOV     B,A      ;SAVE COUNT
3194 16A8 23      INX     H        ;ADDRESS OF BREAK
3195 16A9 5E      MOV     E,M      ;LOW ADDR
3196 16AA 23      INX     H
3197 16AB 56      MOV     D,M      ;HIGH ADDR
3198 16AC 23      INX     H
3199 16AD 7E      MOV     A,M      ;INSTRUCTION
3200 16AE 12      STAX    D        ;BACK TO PROGRAM
3201 16AF 78      MOV     A,B      ;RESTORE COUNT
3202 16B0 C3A216   JMP     CLERO
3203
3204              ;
3205              ; CLER1:
3206 16B3 E1      POP     H        ;RESTORE PLOC
3207 16B4 F1      POP     PSW      ;RESTORE CONDITION RSTIN=INSTRUCTION
3208 16B5 CAD716   JZ      SOFTBRK ;SKIP TO SOFTBREAK IF RST INSTRUCTION
3209 16B8 23      INX     H        ;FRONT PANEL INTERRUPT, DON'T DEC PLOC
3210 16B9 22761A   SHLD    PLOC      ;INCREMENTED
3211 16BC EB      XCHG         ;PLOC TO DE
3212              IF      ISIS2    ;CHECK FOR BELOW BDTOP
3213              LXI     B,BDTOP
3214              CALL    BCDE
3215              JNC     SOFTBRK
3216              ELSE
3217 16BD 21AA06   LXI     H,TRAPJMP+1 ;ADDRESS IFELD OF JMP BDOS
3218 16C0 4E      MOV     C,M      ;LOW ADDRESS
3219 16C1 23      INX     H        ;HIGH ADDRESS
3220 16C2 46      MOV     B,M      ;BC IS BDOS ADDRESS
3221 16C3 CDF810   CALL    BCDE      ;TO COMPARE
3222 16C6 DAD716   JC      SOFTBRK
3223
3224              ;
3225              ; IN THE BDOS, DON'T BREAK UNTIL THE RETURN OCCURS
3226 16C9 CD4E16   CALL    CLRTRACE
3227 16CC 2AF219   LHLD    RETLOC ;TRAPPED UPON ENTRY TO BDOS
3228 16CF EB      XCHG
3229 16D0 3E82     MVI     A,82H    ;LOOKS LIKE G,BBBB
3230 16D2 B7      ORA     A        ;SETS FLAGS
3231 16D3 37      STC         ;', ' AFTER G
3232 16D4 C36C09   JMP     GPR      ;TO SET BREAK POINTS
3233
3234              ;
3235              ; SOFTBRK:
3236              ; NOW CHECK FOR A MATCHING ADDRESS FOR A PERMANENT BREAK
3237 16D7 3ACE19   LDA     PBTRACE ;FF IF TRACE FROM LAST PERM BREAK
3238 16DA B7      ORA     A        ;FF IF TRACED
3239 16DB C27C17   JNZ     STOPCRX ;STOP IF SO
3240
3241              ;
3242              ; MAY BE ACTIVE PERMANENT BREAKS, ARE WE AT ONE NOW?
3243 16DE 21CF19   LXI     H,PBTABLE
3244 16E1 0E08     MVI     C,PBSIZE
3245              ; CHKPBO: ;CHECK NEXT ELEMENT FOR PERMANENT BREAK ADDRESS
3246 16E3 E5      PUSH    H        ;SAVE CURRENT PBTABLE ADDRESS
3247 16E4 7E      MOV     A,M      ;(COUNT)
3248 16E5 B7      ORA     A        ;SET FLAGS
3249 16E6 CA3917   JZ      CHKPBJ ;SKIP IF ZERO

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3249 16E9 23      INX      H      ;LOW(ADDR)
3250 16EA 7E      MOV      A,M     ;LOW(ADDR) IN A
3251 16EB 23      INX      H
3252 16EC 56      MOV      D,M     ;HIGH(ADDR) IN D
3253 16ED 2A761A   LHLD      PLOC   ;PROGRAM LOCATION
3254 16F0 BD      CMP      L      ;LOW(ADDR) = LOW(PLOC)?
3255 16F1 C23917   JNZ      CHKP83  ;SKIP IF NOT
3256 16F4 7A      MOV      A,D     ;CHECK HIGH BYTES
3257 16F5 BC      CMP      H
3258 16F6 C23917   JNZ      CHKP83  ;SKIP IF ADDR <> PLOC
3259              ;
3260              ;      ADDRESSES MATCH, PRINT TRACE OR STOP
3261 16F9 E1      POP      H      ;RECALL ELEMENT ADDRESS
3262 16FA 7E      MOV      A,M     ;PASS COUNT
3263 16FB 3D      DCR      A      ;1 BECOMES 0
3264 16FC C20717   JNZ      CHKP81  ;SKIP IF NOT LAST COUNT
3265              ;
3266              ;      STOP EXECUTION AT THIS POINT
3267 16FF F5      PUSH     PSW     ;FOR 'PASS' REPORT BELOW
3268 1700 3D      DCR      A      ;00 BECOMES FF
3269 1701 32CE19   STA      PBTRACE ;PERM BREAK TRACE ON
3270              ;      TRACE IS CLEARED ON NEXT ITERATION THROUGH CODE
3271              ;      ZERO IN ACCUMULATOR PRINTED IN TRACE HEADING
3272 1704 C31E17   JMP      CHKTRAO ;TO TRACE AND STOP
3273              ;
3274              ;      CHKP81:      ;NOT THE LAST COUNT, DECREMENT AND SET AUTO MODE
3275 1707 77      MOV      M,A     ;COUNT=COUNT-1
3276 1708 F5      PUSH     PSW     ;SAVE COUNT
3277 1709 CDB217   CALL     DECTRA ;DECREMENT TRACE COUNTERS
3278 170C FE02     CPI      2      ;TRACE MODE = 2?
3279 170E CA1E17   JZ       CHKTRAO ;SKIP TO PRINT TRACE IF SO
3280              ;
3281              ;      MUST BE U/-U OR G/-G, CHECK NEGATIVE COMMAND
3282 1711 3AEF19   LDA      NEGCOM
3283 1714 B7      ORA      A      ;SET TO FF IF -U OR -G
3284 1715 CA1E17   JZ       CHKTRAO ;00 IF U OR G, SO TRACE IT
3285              ;
3286              ;      MUST BE -U OR -G, SO SUPPRESS THE TRACE THROUGH
3287              ;      PLOC WILL MATCH PERM BREAK ADDRESS IN GPR, SO COMPUTE BREAKS
3288 1718 CDF317   CALL     NBRK   ;SETUP BREAK ADDRESSES
3289 171B C36C09   JMP      GPR    ;TO MOVE PAST BREAK ADDRESS
3290              ;
3291              ;      CHKTRAO:
3292              ;      ;PRINT THE HEADER AND GO AROUND AGAIN (MAY BE ONE MORE TIME)
3293              ;      (DECREMENTED COUNT IS CURRENTLY STACKED)
3294 171E CDF412   CALL     CRLF
3295 1721 F1      POP      PSW
3296 1722 3C      INR      A      ;RESTORE COUNT
3297 1723 CDEA12   CALL     PBYTE  ;PRINT THE BYTE VALUE
3298 1726 21AB17   LXI      H,PASSMSG ;HH PASS
3299 1729 CDD112   CALL     PRMSG   ;PASS MESSAGE PRINTED
3300 172C 2A761A   LHLD      PLOC   ;LOCATION COUNTER
3301 172F EB      XCHG      ;READYED FOR PADDY
3302 1730 CD1313   CALL     PADDY   ;PRINT ADDRESS AND SYMBOL
3303 1733 CD4E15   CALL     DSTATE  ;DISPLAY THE CURRENT CPU STATE
3304 1736 C36C09   JMP      GPR    ;TO ITERATE ONE LAST TIME

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3305      ;
3306      CHKP3:      ;MOVE TO NEXT ELEMENT
3307      1739 E1      POP      H      ;RECALL ELEMENT ADDRESS
3308      173A 110400    LXI      D,PBELT ;ELEMENT SIZE
3309      173D 19      DAD      D      ;TO NEXT ELEMENT
3310      173E 0D      DCR      C      ;COUNT TABLE DOWN
3311      173F C2E316    JNZ      CHKPBO
3312      ;
3313      CLER2: ;END OF PERMANENT BREAKPOINT SCAN
3314      ; ARRIVE HERE FOLLOWING SIMPLE BREAK FROM A G COMMAND, OR
3315      ; FOLLOWING AN AUTOJ PAST A PERMANENT BREAK POINT
3316      ; MAY ALSO BE TRACE/UNTRACE MODE
3317      ;
3318      1742 CD0413    CALL     BREAK      ;BREAK AT THE CONSOLE?
3319      1745 C27C17    JNZ      STOPCRX    ;STOP EXECUTION IF SO
3320      1748 CDB217    CALL     DECTRA    ;DECREMENT TRACE FLAGS
3321      174B CA6417    JZ       STOPCR     ;END IF AUTO U NOT SET (TMODE=0)
3322      174E 3D      DCR      A      ;1=UNTRACE BECOMES 0
3323      174F C25817    JNZ      BREAK1     ;SKIP TO PRINT TRACE IF NOT
3324      ;
3325      ; UNTRACE MODE, WITH OR WITHOUT AUTOJ SET
3326      ; CURRENT PLOC IS NOT A PERMANENT BREAK ADDRESS
3327      1752 CDF317    CALL     NBRK      ;NEXT BREAK COMPUTED
3328      1755 C36C09    JMP      GPR      ;GO TO THE PROGRAM UNTRACED
3329      ;
3330      BREAK1:      ;MUST BE TRACE MODE, NOT A PERMANENT BREAK ADDRESS
3331      ; WITH OR WITHOUT THE AUTOJ FLAG SET
3332      1758 2A761A    LHLD     PLOC      ;LABEL TRACE
3333      175B CD3513    CALL     PRLABEL
3334      175E CD4E15    CALL     DSTATE    ;DISPLAY CPU STATE
3335      1761 C36C09    JMP      GPR      ;TO NEXT MACHINE INSTRUCTION
3336      ;
3337      STOPCR:      ;NOT UNTRACE/TRACE MODE, IF AUTOJ SET THEN CONTINUE
3338      ; SINCE THIS MUST BE A STEP THROUGH A BREAK POINT
3339      1764 3A6C19    LDA      AUTOJ
3340      1767 B7      ORA      A      ;ZERO SET?
3341      1768 CA7C17    JZ       STOPCRX    ;SKIP IF AUTOJ NOT SET
3342      ; AUTO J SET, MUST BE STEP THROUGH A BREAK POINT, NEXT ADDRESS
3343      ; IS NOT A PERMANENT BREAK POINT, SO GO TO USER BREAKS
3344      176B 2A7019    LHLD     GOBRK2    ;AUXILIARY BREAK POINT
3345      176E 4D      MOV      C,L      ;TO BC
3346      176F 44      MOV      B,H      ;IN CASE SET
3347      1770 2A6E19    LHLD     GOBRK1    ;PRIMARY BREAK POINT
3348      1773 EB      XCHG      ;TO DE
3349      1774 3A6D19    LDA      GOBRKS    ;NUMBER OF BREAKS SET BY USER
3350      1777 B7      ORA      A      ;MAY SET THE ZERO FLAG
3351      1778 37      STC       ;CARRY INDICATES USE CURRENT PLOC
3352      1779 C36C09    JMP      GPR      ;TO CONTINUE
3353      ;
3354      STOPCRX:
3355      177C CDF412    CALL     CRLF
3356      ;
3357      STOPEX:
3358      177F CDE517    CALL     RESPBC    ;RESTORE PBCNT/PBLOC, IF NECESSARY
3359      1782 210000    LXI      H,0
3360      1785 22AA19    SHLD     USERBRK    ;CLEAR USER BREAK ADDRESS

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3361 1788 CD4E11 CALL CLRTRACE ;TRACE FLAGS GO TO ZERO
3362 178B 32CE19 STA PBTRACE ;CLEAR PERM TRACE FLAG
3363 178E 3E2A MVI A,'*'
3364 1790 CDC412 CALL PCHAR
3365 1793 2A761A LHL PLOC
3366 ; CHECK TO ENSURE DISASSEMBLER IS PRESENT
3367 1796 CD8312 CALL CHKDIS
3368 1799 D29F17 JNC STOPO
3369 179C 220C00 SHLD DISPC
3370 179F CD1213 STOPO: CALL PADDSH ;PRINT ADDRESS WITH SYMBOL LOCATION
3371 17A2 2A741A LHL HLOC
3372 17A5 226319 SHLD DISLOC
3373 17A8 C32C07 JMP START
3374 ;
3375 PASSMSG:
3376 17AB 2050415353 DB ' PASS ',0 ;PRINTED IN PASS TRACE
3377 ;
3378 DECTRA: ;DECREMENT TRACE FLAGS IF TRACE MODE
3379 17B2 21A919 LXI H,THODE ;TRACE MODE 0 IF OFF, 1 UN, 2 TR
3380 17B5 7E MOV A,M ;TO ACCUM
3381 17B6 B7 ORA A ;SET CONDITION FLAGS
3382 17B7 C8 RZ ;NO ACTION IF OFF
3383 17B8 E5 PUSH H ;SAVE THODE ADDRESS
3384 17B9 2AAC19 LHLD TRACER ;GET COUNT
3385 17BC 2B DCX H ;COUNT=COUNT-1
3386 17BD 22AC19 SHLD TRACER ;BACK TO MEMORY
3387 17C0 7C MOV A,H ;NOW ZERO?
3388 17C1 B5 ORA L ;HL=0000?
3389 17C2 E1 POP H ;RESTORE THODE ADDRESS
3390 17C3 C2CB17 JNZ DECTRO ;SKIP IF NOT
3391 17C6 77 MOV M,A ;THODE = 0
3392 17C7 3D DCR A ;ACCUM = FF
3393 17C8 32CE19 STA PBTRACE ;TO STOP ON NEXT ITERATION
3394 17CB 7E DECTRO: MOV A,M ;RECALL THODE
3395 17CC B7 ORA A ;SET FLAGS
3396 17CD C9 RET
3397 ;
3398 CAT: ;DETERMINE OPCODE CATEGORY - CODE IN REGISTER B
3399 ; D,E CONTAIN DOUBLE PRECISION CATEGORY NUMBER ON RETURN
3400 17CE 110D00 LXI D,OPMAX ;D=0,E=OPMAX
3401 17D1 211E19 LXI H,OPLIST
3402 17D4 7E CATO: MOV A,M ;MASK TO A
3403 17D5 A0 ANA B ;MASK OPCODE FROM B
3404 17D6 23 INX H ;READY FOR COMPARE
3405 17D7 BE CMP H ;SAME AFTER MASK?
3406 17D8 23 INX H ;READY FOR NEXT COMPARE
3407 17D9 CAE117 JZ CAT1 ;EXIT IF COMPARED OK
3408 17DC 14 INR D ;UP COUNT IF NOT MATCHED
3409 17DD 1D DCR E ;FINISHED?
3410 17DE C2D417 JNZ CATO
3411 17E1 5A CAT1: MOV E,D ;E IS CATEGORY NUMBER
3412 17E2 1600 MVI D,0 ;DOUBLE PRECISION
3413 17E4 C9 RET
3414 ;
3415 RESPBC: ;RESTORE PBCNT TO PBLOC, IF REQ'D
3416 17E5 3A7419 LDA PBLOC ;00 IF NO AUTO U

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3417 17E8 B7      ORA    A      ;SET FLAGS
3418 17E9 C8      RZ        ;NO FURTHER ACTIONS IF SO
3419 17EA 2A7219   LHLD    PBLOC  ;PBTABLE ELEMENT TO RESTORE
3420 17ED 77      MOV     M,A     ;(COUNT)
3421 17EE AF      XRA     A      ;CLEAR ACCUMULATOR
3422 17EF 327419   STA     PBCNT  ;CLEAR AUTO U MODE
3423 17F2 C9      RET
3424              ;
3425              NBRK: ;FIND NEXT BREAK POINT ADDRESS
3426              ;      UPON RETURN, REGISTER A IS SETUP AS IF USER TYPED G,B1,B2 OR
3427              ;      G,B1 DEPENDING UPON OPERATOR CATEGORY. B,C CONTAINS SECOND BP,
3428              ;      D,E CONTAINS PRIMARY BP. HL ADDRESS NEXT OPCODE BYTE
3429 17F3 2A761A   LHLD    PLOC
3430 17F6 46      MOV     B,M     ;GET OPERATOR
3431 17F7 23      INX     H      ;HL ADDRESS BYTE FOLLOWING OPCODE
3432 17F8 E5      PUSH    H      ;SAVE IT FOR LATER
3433 17F9 CDCE17   CALL    CAT    ;DETERMINE OPERATOR CATEGORY
3434 17FC 21F119   LXI     H,CATNO ;SAVE CATEGORY NUMBER
3435 17FF 73      MOV     M,E
3436 1800 210A18   LXI     H,CATTAB;CATEGORY TABLE BASE
3437 1803 19      DAD     D      ;INXED
3438 1804 19      DAD     D      ;INXED*2
3439 1805 5E      MOV     E,M     ;LOW BYTE TO E
3440 1806 23      INX     H
3441 1807 56      MOV     D,M     ;HIGH BYTE TO D
3442 1808 EB      XCHG
3443 1809 E9      PCHL        ;JUMP INTO TABLE
3444              ;
3445              ;      OPCODE CATEGORY TABLE
3446 0002 =        CALLOP EQU    2      ;POSITION OF CALL OPERATOR
3447 0003 =        CALLCON EQU    3      ;POSITION OF CALL CONDITIONAL
3448 180A 2618     CATTAB: DW      JMPOP  ;JUMP OPERATOR
3449 180C 4E18     DW      CCOP   ;JUMP CONDITIONAL
3450 180E 2618     DW      JMPOP  ;CALL OPERATOR (TREATED AS JMP)
3451 1810 4E18     DW      CCOP   ;CALL CONDITIONAL
3452 1812 2C18     DW      RETOP  ;RETURN FROM SUBROUTINE
3453 1814 6018     DW      RSTOP  ;RESTART
3454 1816 7218     DW      PCOP   ;PCHL
3455 1818 A318     DW      IMOP   ;SINGLE PRECISION IMMEDIATE (2 BYTE)
3456 181A A318     DW      IMOP   ;ADI ... CPI
3457 181C A018     DW      DIMOP  ;DOUBLE PRECISION IMMEDIATE (3 BYTES)
3458 181E A018     DW      DIMOP  ;LHLD ... STA
3459 1820 9618     DW      RCOND  ;RETURN CONDITIONAL
3460 1822 A318     DW      IMOP   ;IN/OUT
3461              ;      NEXT DW MUST BE THE LAST IN THE SEQUENCE
3462 1824 9118     DW      SIMOP  ;SIMPLE OPERATOR (1 BYTE)
3463              ;
3464              JMPOP: ;GET OPERAND FIELD, CHECK FOR BDOS
3465 1826 CD3C18     CALL    GETOPA ;GET OPERAND ADDRESS TO D,E AND COMPARE WITH BDOS
3466 1829 C2A618     JNZ     ENDOP  ;TREAT AS SIMPLE OPERATOR IF NOT BDOS
3467              ;      OTHERWISE, TREAT AS A RETURN INSTRUCTION
3468 182C CD4718     RETOP: CALL    GETSP ;ADDRESS AT STACKTOP TO D,E
3469 182F C3A618     JMP     ENDOP  ;TREAT AS SIMPLE OPERATOR
3470              ;
3471              CBDOS: ;DE ADDRESSES A POSSIBLE BREAK POINT - CHECK TO ENSURE
3472              ;      IT IS NOT A JUMP TO THE BDOS

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3473 ;
3474 1832 3AAA06 LDA TRAPJMP+1 ;LOW BDOS ADDRESS
3475 1835 BB CMP E
3476 1836 C0 RNZ
3477 1837 3AAB06 LDA TRAPJMP+2 ;HIGH BDOS ADDRESS
3478 183A BA CMP D
3479 183B C9 RET
3480 ;
3481 GETOPA: ;GET OPERAND ADDRESS AND COMPARE WITH BDOS
3482 183C C1 POP B ;GET RETURN ADDRESS
3483 183D E1 POP H ;GET OPERAND ADDRESS
3484 183E 5E MOV E,H
3485 183F 23 INX H
3486 1840 56 MOV D,H
3487 1841 23 INX H
3488 1842 E5 PUSH H ;UPDATED PC INTO STACK
3489 1843 C5 PUSH B ;RETURN ADDRESS TO STACK
3490 1844 C33218 JMP CBDS ;RETURN THROUGH CBDS WITH ZERO FLAG SET
3491 ;
3492 GETSP: ;GET RETURN ADDRESS FROM USER'S STACK TO D,E
3493 1847 2A721A LHL D SLOC
3494 184A 5E MOV E,H
3495 184B 23 INX H
3496 184C 56 MOV D,H
3497 184D C9 RET
3498 ;
3499 CCOP: ;CALL CONDITIONAL OPERATOR
3500 184E CD3C18 CALL GETOPA ;GET OPERAND ADDRESS TO D,E / COMPARE WITH BDOS
3501 1851 CA5B18 JZ CCOP1
3502 ; NOT THE BDOS, BREAK AT OPERAND ADDRESS AND NEXT ADDRESS
3503 1854 C1 POP B ;NEXT ADDRESS TO B,C
3504 1855 C5 PUSH B ;BACK TO STACK
3505 1856 3E02 MVI A,2 ;TWO BREAKPOINTS
3506 185B C3AB18 JMP RETCAT ;RETURN FROM NBRK
3507 ;
3508 CCOP1: ;BREAK ADDRESS AT NEXT LOCATION ONLY, WAIT FOR RETURN FROM BDOS
3509 185B D1 POP D
3510 185C D5 PUSH D ;BACK TO STACK
3511 185D C3A618 JMP ENDOP ;ONE BREAKPOINT ADDRESS
3512 ;
3513 RSTOP: ;RESTART INSTRUCTION - CHECK FOR RST 7
3514 1860 78 MOV A,B
3515 1861 FEFF CPI RSTIN ;RESTART INSTRUCTION USED FOR SOFT INT
3516 1863 C26A18 JNZ RST0
3517 ;
3518 ; SOFT RST, NO BREAK POINT SINCE IT WILL OCCUR IMMEDIATELY
3519 1866 AF XRA A
3520 1867 C3AA18 JMP RETCAT1 ;ZERO ACCUMULATOR
3521 186A E638 RST0: ANI 111000B ;GET RESTART NUMBER
3522 186C 5F MOV E,A
3523 186D 1600 MVI D,0 ;DOUBLE PRECISION BREAKPOINT TO D,E
3524 186F C3A618 JMP ENDOP
3525 ;
3526 PCOP: ;PCHL
3527 1872 2A741A LHL HLOC
3528 1875 EB XCHG ;HL VALUE TO D,E FOR BREAKPOINT

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3529 1876 CD3218      CALL   CBDOS   ;BDOS VALUE?
3530 1879 C2A618      JNZ     ENDOP
3531                  ;      PCHL TO BDOS, USE RETURN ADDRESS
3532 187C C32C18      JMP     RETOP
3533                  ;
3534                  CHKCALL:
3535                  ;CHECK FOR CALL OR CALL CONDITIONAL OPERATOR,
3536                  ;IF FOUND, USE THE RETURN ADDRESS (PC+3) AS BREAK
3537                  ;RETURN "NO CARRY" IF CALL OR CALL CONDITIONAL
3538 187F 3AF119      LDA     CATNO   ;CATEGORY NUMBER
3539 1882 FE02      CPI     CALLOP   ;CATEGORY NUMBER FOR CALL OPERATOR
3540 1884 D8          RC          ;CARRY IF BELOW CALLOP
3541                  ;      MUST BE CALL OPERATOR OR ABOVE
3542 1885 FE04      CPI     CALLCON+1
3543                  ;      CARRY SET IF BELOW CALLCON+1, SO COMPLEMENT
3544 1887 3F          CMC          ;CARRY IF CALLCON+1 OR ABOVE
3545 1888 D8          RC          ;CARRY IMPLIES NOT BETWEEN CALLOP AND CALLCON
3546                  ;      MUST BE BETWEEN CALLOP AND CALLCON (INCLUSIVE)
3547                  ;      USE PC+3 AS THE BREAK FOR TW/UW OR ROM ENTRY
3548 1889 2A761A     LHL     PLOC
3549 188C 23          INX     H
3550 188D 23          INX     H
3551 188E 23          INX     H      ;PLOC+3
3552 188F EB          XCHG        ;TO DE
3553 1890 C9          RET         ;WITH THE NO-CARRY BIT SET
3554                  ;
3555                  ;
3556                  SIMOP: ;SIMPLE OPERATOR, USE STACKED PC
3557 1891 D1          POP     D
3558 1892 D5          PUSH    D
3559 1893 C3A618     JMP     ENDOP
3560                  ;
3561                  RCOND: ;RETURN CONDITIONAL
3562 1896 CD4718     CALL   GETSP   ;GET RETURN ADDRESS FROM STACK
3563 1899 C1          POP     B      ;B,C ALTERNATE LOCATION
3564 189A C5          PUSH    B      ;REPLACE IT
3565 189B 3E02      MVI     A,2
3566 189D C3A818     JMP     RETCAT ;TO SET FLAGS AND RETURN
3567                  ;
3568                  DIMOP: ;DOUBLE PRECISION IMMEDIATE OPERATOR
3569 18A0 D1          POP     D
3570 18A1 13          INX     D      ;INCREMENTED ONCE, DROP THRU FOR ANOTHER
3571 18A2 D5          PUSH    D      ;COPY BACK
3572                  ;
3573                  IMOP: ;SINGLE PRECISION IMMEDIATE
3574 18A3 D1          POP     D
3575 18A4 13          INX     D
3576 18A5 D5          PUSH    D
3577                  ;
3578                  ENDOP: ;END OPERATOR SCAN
3579 18A6 3E01      MVI     A,1     ;SINGLE BREAKPOINT
3580                  RETCAT: ;RETURN FROM NBRK
3581 18A8 3C          INR     A      ;COUNT UP FOR G,...
3582 18A9 37          STC
3583                  RETCAT1:
3584 18AA F5          PUSH    PSW     ;SAVE REGISTER STATE IN CASE USERBRK

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3585 18AB 2AAA19    LHL    USERBRK
3586 18AE 7C        MOV     A,H
3587 18AF B5        ORA     L
3588 18B0 CADB18    JZ      RETCAT2 ;NO USERBRK IF ZERO
3589                ;
3590 18B3 D5        PUSH    D      ;SAVE BREAK POINT
3591 18B4 C5        PUSH    B      ;SAVE AUX BREAK POINT
3592 18B5 E5        PUSH    H      ;SAVE USERBRK ADDRESS FOR PCHL BELOW
3593                ; USER BREAK OCCURS HERE, CALL USER ROUTINE AND CHECK RETURN
3594 18B6 21F119    LXI      H,CATNO
3595 18B9 4E        MOV     C,M      ;OPCODE CATEGORY IS IN C
3596 18BA 2A761A    LHL      PLOC
3597 18BD EB        XCHG          ;LOCATION OF INSTRUCTION IN D,E
3598 18BE 21C318    LXI      H,RETUSER
3599 18C1 E3        XTHL          ;RETURN ADDRESS TO STACK, USERBRK TO H,L
3600 18C2 E9        PCHL
3601                RETUSER:      ;RETURN FROM USER BREAK, CHECK REGISTER A
3602 18C3 B7        ORA     A
3603 18C4 C1        POP     B      ;RESTORE BREAKPOINTS
3604 18C5 D1        POP     D
3605 18C6 CADB18    JZ      RETCAT2
3606                ; ABORT THE OPERATION WITH A CONDITION
3607 18C9 F5        PUSH    PSW
3608 18CA 3E23      MVI     A,'4'
3609 18CC CDC412    CALL    PCHAR
3610 18CF F1        POP     PSW
3611 18D0 CDEA12    CALL    PBYTE
3612 18D3 3E20      MVI     A,' '
3613 18D5 CDC412    CALL    PCHAR
3614 18D8 C37F17    JMP     STOPEX ;STOP EXECUTION
3615                RETCAT2:
3616                ;CHECK FOR CALL OPERATOR WITH TW OR UW MODE SET
3617 18DB 3AA919    LDA      THODE
3618 18DE 21F019    LXI      H,WDISP ;WDISP=FF IF W ENCOUNTERED
3619 18E1 A6        ANA      M      ;NON ZERO IF THODE>0, WHODE SET
3620 18E2 CAF118    JZ      NOTCALL ;SKIP IF NOT A CALL
3621                ;
3622                ; THIS MAY BE A CALL OR CALL CONDITION IN TW/UW MODE
3623 18E5 CD7F18    CALL    CHKCALL ;CHECK FOR CALL, NC SET IF FOUND
3624 18E8 DAF118    JC      NOTCALL ;SKIP IF NOT A CALL
3625                ;
3626                ; THIS IS A CALL IN TW/UW MODE, DE IS PC+3, USE IT FOR BREAK
3627 18EB F1        POP     PSW      ;PREVIOUS BREAK COUNT IN A
3628 18EC 3E02      MVI     A,2      ;USE ONLY ONE BREAK
3629 18EE C31C19    JMP     RETCAT4 ;TO RETURN FROM NBRK
3630                ;
3631                NOTCALL:
3632 18F1 F1        POP     PSW      ;RECALL G, STATE
3633 18F2 F5        PUSH    PSW      ;SAVE FOR FINAL RETURN BELOW
3634                ;
3635                ; NOW CHECK TO ENSURE THAT BREAK IS NOT IN ROM
3636 18F3 B7        ORA     A      ;ZERO BREAK POINTS SET?
3637 18F4 CA1B19    JZ      RETCAT3 ;SKIP TO END IF SO
3638                ;
3639                ; MUST BE 2/3 IN ACCUMULATOR
3640 18F7 3D        DCR     A      ;RESULTING IN 1/2 BREAKPOINTS

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3641      ;      BC = AUX BREAKPOINT, DE = PRIMARY BREAKPOINT
3642 18F8 E8      ROMRAM:      XCHG      ;FIRST/AUX BREAKPOINT TO HL
3643 18F9 5F      MOV      E,A      ;BREAKPOINT COUNT TO E (1/2)
3644 18FA 7E      MOV      A,M      ;GET CODE BYTE
3645 18FB 2F      CMA      ;COMPLEMENT FOR ROM TEST
3646 18FC 77      MOV      M,A      ;STORE TO ROM/RAM
3647 18FD BE      CMP      M      ;DID IT CHANGE?
3648 18FE 2F      CMA      ;COMPLEMENT BACK TO ORIGINAL
3649 18FF 77      MOV      M,A      ;RESTORE IN CASE RAM
3650 1900 7B      MOV      A,E      ;RESTORE BREAKPOINT COUNT
3651      ;      ARRIVE HERE WITH ZERO FLAG SET IF RAM BREAK
3652 1901 EB      XCHG      ;BREAK ADDRESS BACK TO DE
3653 1902 F5      PUSH     PSW      ;SAVE COUNT
3654 1903 CA0F19   JZ      RAMLOC   ;SKIP IF RAM LOCATION
3655      ;
3656      ;      BREAK ADDRESS IS IN ROM. IF CONDITIONAL CALL, LET
3657      ;      IT GO, THE RETURN BREAK IS ALREADY SET. IF A SIMPLE
3658      ;      CALL, SET BREAK AT THE PLOC+3. OTHERWISE, ASSUME THAT
3659      ;      THE STACK CONTAINS THE RETURN ADDRESS
3660 1906 CD7F18   CALL     CHKCALL ;CHECK FOR CALL OR CALL CONDITIONAL
3661 1909 D20F19   JNC      RAMLOC   ;NC IF FOUND, DE IS RETURN ADDRESS
3662      ;      ;NOT A CALL OPERATION, MUST BE PCHL OR JMP
3663 190C CD4718   CALL     GETSP    ;GET THE RETURN ADDRESS FROM STACK
3664      ;
3665 190F F1      RAMLOC:      POP      PSW      ;RESTORE BREAK COUNT
3666 1910 3D      DCR      A      ;1/2 BREAKS BECOMES 0/1
3667 1911 CA1B19   JZ      RETCAT3 ;STOP ANALYSIS IF BREAKS EXHAUSTED
3668      ;      OTHERWISE, EXCHANGE BC/DE AND RETRY
3669 1914 D5      PUSH     D      ;DE SAVED FOR EXCHANGE
3670 1915 59      MOV      E,C      ;LOW BC TO LOW DE
3671 1916 50      MOV      D,B      ;HIGH BC TO HIGH DE
3672 1917 C1      POP      B      ;OLD DE TO BC
3673 1918 C3F818   JMP      ROMRAM   ;TO ANALZE NEXT BREAK
3674      ;
3675      RETCAT3:
3676      ;      ;ANALYSIS OF ROM/RAM COMPLETE, RESTORE COUNTS
3677 191B F1      POP      PSW      ;BREAK COUNT AND CARRY
3678      RETCAT4:
3679 191C E1      POP      H      ;NEXT ADDRESS RECALLED
3680 191D C9      RET
3681      ;
3682      ;
3683      ;
3684      ;      OPCODE CATEGORY TABLES
3685 191E FFC3      OPLIST:      DB      1111$1111B,      1100$0011B      ;0 JMP
3686 1920 C7C2      DB      1100$0111B,      1100$0010B      ;1 JCOND
3687 1922 FFC0      DB      1111$1111B,      1100$1101B      ;2 CALL
3688 1924 C7C4      DB      1100$0111B,      1100$0100B      ;3 CCOND
3689 1926 FFC9      DB      1111$1111B,      1100$1001B      ;4 RET
3690 1928 C7C7      DB      1100$0111B,      1100$0111B      ;5 RST 0..7
3691 192A FFE9      DB      1111$1111B,      1110$1001B      ;6 PCHL
3692 192C C706      DB      1100$0111B,      0000$0110B      ;7 MVI
3693 192E C7C6      DB      1100$0111B,      1100$0110B      ;8 ADI...CPI
3694 1930 CF01      DB      1100$1111B,      0000$0001B      ;9 LXI
3695 1932 E722      DB      1110$0111B,      0010$0010B      ;10 LHLD SHLD LDA STA
3696 1934 C7C0      DB      1100$0111B,      1100$0000B      ;11 RCOND

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3697 1936 F7D3      DB      1111$0111B,  1101$0011B      ;IN OUT
3698 000D =        OPMAX EQU      ($-OPLIST)/2
3699              ;
3700              ;      SYMBOL ACCESS ALGORITHMS
3701      ALOOKUP:
3702      ;LOOK FOR THE SYMBOL WITH ADDRESS GIVEN BY DE
3703      ;RETURN WITH NON ZERO FLAG IF FOUND, ZERO IF NOT FOUND
3704      ;WHEN FOUND, BASE ADDRESS IS RETURNED IN HL:
3705      ;          : HIGH ADDR :
3706      ;          : LOW ADDR:
3707      ;      HL:  : LENGTH  :
3708      ;          : CHAR 1 :
3709      ;          :
3710      ;          : CHAR LEN:
3711      ;      (LIST TERMINATED BY LENGTH > 15)
3712 1938 2A8119      LHLD  SYTOP  ;TOP SYMBOL IN TABLE
3713 193B 23          INX   H      ;TO LOW ADDRESS
3714 193C 23          INX   H      ;TO HIGH ADDRESS FIELD
3715 193D 46          ALOOK0: MOV   B,M      ;HIGH ADDRESS
3716 193E 2B          DCX   H
3717 193F 4E          MOV   C,M      ;LOW ADDRESS
3718 1940 2B          DCX   H      ;LENGTH
3719 1941 7E          MOV   A,M      ;GET LENGTH
3720 1942 FE10        CPI    16      ;MAX LENGTH IS 15
3721 1944 D26119      JNC   ALOOK2  ;TO STOP THE SEARCH
3722 1947 E5          PUSH  H      ;SAVE CURRENT LOCATION IN CASE MATCHED
3723 1948 2F          CMA          ;1'S COMPLEMENT OF LOW(LENGTH)
3724 1949 85          ADD   L      ;ADD TO HL
3725 194A 6F          MOV   L,A
3726 194B 3EFF        MVI   A,OFFH  ;1'S COMPLEMENT OF HIGH(LENGTH)
3727 194D 8C          ADC   H      ;PROPAGATE CARRY FOR SUBTRACT
3728 194E 67          MOV   H,A      ;HL IS HL-LENGTH-1
3729              ;      NOW COMPARE SYMBOL ADDRESS
3730 194F 7B          MOV   A,E      ;LOW OF SEARCH ADDRESS
3731 1950 89          CMP   C      ;LOW OF SYMBOL ADDRESS
3732 1951 C25C19      JNZ   ALOOK1  ;SKIP IF UNEQUAL
3733 1954 7A          MOV   A,D
3734 1955 90          SUB   B      ;SKIP IF UNEQUAL
3735 1956 C25C19      JNZ   ALOOK1
3736              ;      SYMBOL MATCHED, RETURN HL AS SYMBOL ADDRESS
3737 1959 E1          POP   H
3738 195A 3C          INR   A      ;DIFFERENCE WAS ZERO
3739 195B C9          RET          ;WITH NON ZERO FLAG SET
3740              ;
3741      ALOOK1:      ;SYMBOL NOT MATCHED, LOOK FOR NEXT
3742 195C 33          INX   SP
3743 195D 33          INX   SP      ;REMOVE STACKED ADDRESS
3744 195E C33D19      JMP   ALOOK0  ;FOR ANOTHER SEARCH
3745              ;
3746              ;      SYMBOL ADDRESS NOT FOUND
3747 1961 AF          ALOOK2: XRA   A
3748 1962 C9          RET          ;WITH ZERO FLAG SET
3749              ;
3750              ;
3751              ;      *****
3752              ;      *

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3753      ;      *      DAT. STRUCTURES      *
3754      ;      *      *
3755      ;      *****
3756      ;
3757      ; D - STRUCTURES
3758 1963   DISLOC: DS      2      ;DISPLAY LOCATION
3759 1965 00   DISEND: DB      FALSE ;STORAGE FOR END OF DISPLAY
3760 1966   DISMAX: DS      2      ;MAX VALUE FOR CURRENT DISPLAY
3761 1968   TDISP: DS      2      ;TEMP 16 BIT LOCATION
3762 196A   DISTMP: DS      2      ;TEMP STORAGE FOR 16BIT ADD
3763      ;
3764      ; G - STRUCTURES
3765 196C   AUTOU: DS      1      ;FF IF AUTO 'U' COMMAND IN EFFECT
3766 196D   GOBRKS: DS      1      ;NUMBER OF BREAKS IN GO COMMAND
3767 196E   GOBRK1: DS      2      ;PRIMARY BREAK IN GO COMMAND
3768 1970   GOBRK2: DS      2      ;SECONDARY BREAK IN GO COMMAND
3769 1972   PBLOC: DS      2      ;PBTABLE LOCATION FOR AUTO U
3770 1974 00   PBCNT: DB      00      ;PERMANENT BREAK TEMP COUNTER
3771      ;
3772      ; H - STRUCTURES
3773      DTABLE:      ;DECIMAL DIVISION TABLE
3774 1975 1027      DW      10000
3775 1977 E803      DW      1000
3776 1979 6400      DW      100
3777 197B 0A00      DW      10
3778 197D 0100      DW      1
3779      ;
3780      ; R - STRUCTURES
3781 197F   BIAS: DS      2      ;HOLDS R BIAS VALUE FOR LOAD
3782 1981   SYTOP: DS      2      ;HIGH SYMBOL TABLE ADDRESS
3783 1983   MLOAD: DS      2      ;MAX LOAD ADDRESS
3784 1985   DASH: DS      1      ;00 IF DIS/ASSEM PRESENT, 01 IF NOT
3785 1986 0D0A53594D MSG: DB      CR,LF,'SYMBOLS',0
3786 1990 0D0A4E4558L MSG: DB      CR,LF,'NEXT MSIZE PC END',CR,LF,0
3787 19A7   DEFLOAD: DS      2      ;HOLDS THE DEFAULT READ ADDRESS
3788      ;
3789      ; T - STRUCTURES
3790 19A9   TMODE: DS      1      ;TRACE MODE
3791 19AA   USERBRK: DS      2      ;USER BREAK ADDRESS IF NON-ZERO
3792 19AC   TRACER: DS      2      ;TRACE COUNT
3793      ;
3794      ; W - STRUCTURES
3795 19AE   WRTREC: DS      2      ;# OF WRITTEN RECORDS
3796 19B0   WBEGIN: DS      2      ;BEGINNING ADDRESS OF WRITE
3797 19B2   WEND: DS      2      ;ENDING ADDRESS OF WRITE
3798 19B4 0D0A00   WRMSG: DB      CR,LF,0
3799 19B7 6820726563 WRMSG1: DB      'h record(s) written.',0
3800      ;
3801      ; COMMON TO ALL ROUTINES
3802      ;
3803 19CC 0000   LASTEXP: DW      0000 ;LAST EXPRESSION ENCOUNTERED
3804      ;
3805      PBTRACE:
3806 19CE      DS      1      ;TRACE ON FOR PERM BREAK
3807      PBTABLE:
3808      REPT      PFSIZE ;ONE FOR EACH ELEMENT

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3809          DB      0      ;COUNTER
3810          DS      2      ;ADDRESS
3811          DS      1      ;DATA
3812          ENDM
3813 19CF+00   DB      0      ;COUNTER
3814 19D0+     DS      2      ;ADDRESS
3815 19D2+     DS      1      ;DATA
3816 19D3+00   DB      0      ;COUNTER
3817 19D4+     DS      2      ;ADDRESS
3818 19D6+     DS      1      ;DATA
3819 19D7+00   DB      0      ;COUNTER
3820 19D8+     DS      2      ;ADDRESS
3821 19DA+     DS      1      ;DATA
3822 19DB+00   DB      0      ;COUNTER
3823 19DC+     DS      2      ;ADDRESS
3824 19DE+     DS      1      ;DATA
3825 19DF+00   DB      0      ;COUNTER
3826 19E0+     DS      2      ;ADDRESS
3827 19E2+     DS      1      ;DATA
3828 19E3+00   DB      0      ;COUNTER
3829 19E4+     DS      2      ;ADDRESS
3830 19E6+     DS      1      ;DATA
3831 19E7+00   DB      0      ;COUNTER
3832 19E8+     DS      2      ;ADDRESS
3833 19EA+     DS      1      ;DATA
3834 19EB+00   DB      0      ;COUNTER
3835 19EC+     DS      2      ;ADDRESS
3836 19EE+     DS      1      ;DATA
3837          ;      EACH PERM TABLE ELEMENT TAKES THE FORM:
3838          ;      LOW(COUNT) HIGH(COUNT) LOW(ADDR) HIGH(ADDR) DATA
3839          ;
3840          ;
3841 19EF       NEGCOM: DS      1      ;00 IF NORMAL COMMAND, FF IF "-X"
3842 19F0       WDISP: DS      1      ;00 IF BYTE DISPLAY, FF IF WORD DISPLAY
3843 19F1       CATNO: DS      1      ;CATEGORY NUMBER SAVED IN NBRK
3844 19F2       RETLOC: DS      2      ;RETURN ADDRESS TO USER FROM BDOS
3845 19F4       BREAKS: DS      7      ;#BREAKS/BKPT1/DAT1/BKPT2/DAT2
3846 19FB       EXPLIST: DS      7      ;COUNT+(EXP1)(EXP2)(EXP3)
3847 1A02       NEXTCOM: DS      2      ;NEXT LOCATION FROM COMMAND BUFFER
3848 1A04 40    COMLEN: DB      CSIZE ;MAX COMMAND LENGTH
3849 1A05       CURLEN: DS      1      ;CURRENT COMMAND LENGTH
3850 1A06       COMBUF: DS      CSIZE ;COMMAND BUFFER
3851          ;      TEMPORARY VALUES USED IN "R" COMMAND SHARE END OF BUFFER
3852 1A36 =     TFCB EQU      $-FCBL/2;HOLDS NAME OF SYMBOL FILE DURING CODE LOAD
3853          ;
3854 1A46       DS      SSIZE ;STACK AREA
3855          STACK:
3856 1A76 =     PLOC EQU      STACK-2 ;PC IN TEMPLATE
3857 1A74 =     HLOC EQU      STACK-4 ;HL
3858 1A72 =     SLOC EQU      STACK-6 ;SP
3859 1A71 =     ALOC EQU      STACK-7 ;A
3860 1A70 =     FLOC EQU      STACK-8 ;FLAGS
3861 1A6E =     BLOC EQU      STACK-10 ;BC
3862 1A6C =     DLOC EQU      STACK-12 ;D,E
3863          ;
3864 1A7B 00     NOP          ;FOR RELOCATION BOUNDARY

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CP/M MACRO ASSEM 2.0 #070 Symbolic Interactive Debugger (demon) 7/12/82

55 1A79

END

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ALOC	1A71	1927	2959	3859#							
ALOOK0	193D	3715#	3744								
ALOOK1	195C	3732	3735	3741#							
ALOOK2	1961	3721	3747#								
ALOOKUP	1938	2527	2553	3098	3701#						
ASSEM	0009	53#	54	371							
ASSM	07A3	316	351#								
ASSM0	07BD	357	366#								
ASSM1	07C7	362	371#								
AUTOU	196C	654	674	713	3155	3339	3765#				
AVAL	0005	121#	1888	2938	2984						
BCDE	10F8	639	1021	2070#	3214	3221					
BDBASE	1806	42#	46#	47							
BDOS	1806	36#	45#	46							
BDOSE	0005	33#	181	186	1282	1452	1493	1508	1510	1535	1554
		2107									
BDTOP	2506	43#	47#	3213							
BEGIN	06AC	132	156#								
BIAS	197F	1082	1103	1118	1131	1225	1252	1435	3781#		
BLANK	12C2	480	487	504	504	504	505	505	505	513	538
		539	540	568	821	841	914	944	1173	1547	1550
		1553	1576	1595	1877	2454#	2532	2971	2987	2992	3017
BLOC	1A6E	3092	3110	3861#							
BREAK	1304	143	273	456	955	2503#	3318				
BREAK1	1758	3323	3330#								
BREAKA	0686	133#	235								
BREAKP	1659	134	3125#								
BREAKS	19F4	202	766	3187	3845#						
BVAL	0006	122#	2917								
CALLO	07E6	391	396#								
CALL1	07F2	400	404#								
CALL2	07F6	395	403	407#							
CALLCON	0003	3447#	3542								
CALLOP	0002	3446#	3539								
CALLPR	07CD	318	380#								
CAT	17CE	3398#	3433								
CATO	17D4	3402#	3410								
CAT1	17E1	3407	3411#								
CATNO	19F1	3434	3538	3594	3843#						
CATTAB	180A	3436	3448#								
CBDOS	1832	3471#	3490	3529							
CCDP	184E	3449	3451	3499#							
CCOP1	185B	3501	3508#								
CERROR	1094	300	302	317	325	326	329	330	332	340	341
		354	368	383	384	438	605	634	812	969	988
		1001	1058	1068	1080	1120	1148	1195	1220	1242	1289
		1295	1340	1413	1462	1467	1506	1571	1627	1644	1690
		1698	1728	1746	1757	1770	1789	1866	1871	1883	1893
		1896	1925	1989#	2157	2215	2220	2618	2638	2744	2754
		2772									
CHECKSY	0D32	1239	1268	1323	1375#						
CHKASC	0E79	1602	1608#								
CHKCALL	187F	3534#	3623	3660							
CHKDIS	12B3	353	987	2441#	2997	3367					
CHKEND	0FA0	1756	1796	1814#							
CHKIO	000B	72#	2507								

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CHKP80	16E3	3244#	3311																	
CHKP81	1707	3264	3274#																	
CHKP83	1739	3248	3255	3258	3306#															
CHKSY0	0053	1393#	1398																	
CHKSYM	0042	1379	1384#																	
CHKTRAO	171E	3272	3279	3284	3291#															
CIF	0001	64#	274																	
CKDFLD	12A5	1280	1338	2428#																
CKMLOAD	129D	1279	1337	2421#																
CLERO	16A2	3190#	3202																	
CLER1	16B3	3191	3204#																	
CLER2	1742	3313#																		
CLER60	169C	3185#																		
CLOSE	124A	1803	2333#																	
CLRTRACE	164E	3118#	3226	3361																
COF	0002	65#	2462																	
COMBUF	1A06	2149	3850#																	
CONDEF	109F	248	613	2002#																
COMLEN	1A04	2147	2645	2688	3848#															
COMLOAD	1293	1378	1505	2411#	2422	2448														
CR	000D	99#	288	1459	1599	1616	1850	1870	2035	2188	2203									
		2209	2214	2303	2498	2604	3785	3786	3786	3798										
CRLF	12FA	276	469	655	818	836	940	1170	1573	1875	1991									
		2497#	2555	2970	3294	3355														
CSIZE	0040	58#	3848	3850																
CURLN	1A05	603	1193	1604	1726	2115	2300	3849#												
DASH	1985	203	1380	2105	2442	3784#														
DBF	0080	81#	1270	1775	1954	2116														
DBFILL	1130	2122#	2128																	
DBP	005B	80#	1946	1959	1972	2325														
DCHEX	1593	2998	3007#																	
DEBUG	0000	12#	14	102	277															
DECTRO	17CB	3390	3394#																	
DECTRA	1782	3277	3320	3378#																
DEF	108E	1969	1975#																	
DEFLOAD	19A7	220	1248	1287	1545	1737	2430	2437	3787#											
DEFREAD	0726	246	252	256	260#															
DELETE	127A	1766	2381#																	
DELF	0013	75#	2386																	
DELIM	1377	2603#																		
DELT	151E	1876	2936#	2976																
DELTO	1531	2939	2949#																	
DELT1	1547	2956	2964#																	
DEMON	0680	31#	2106																	
DEOF	001A	96#	97	1294	1957	1976														
DFCB	005C	82#	83	1197	1263	1765	1786	1802	1966	2327										
DIMOP	18A0	3457	3458	3568#																
DISCH	08C8	495	502	508	529	536	561#													
DISCHO	08DB	571#	579																	
DISCOM	1363	491	2577#	3014																
DISEN	0006	52#	53	1007	3004															
DISEND	1965	586	590	3759#																
DISHL	160B	3055	3061	3066	3079#															
DISIN	0003	32#	52																	
DISKR	105C	1293	1344	1352	1422	1438	1446	1456	1940#											
DISLOC	1963	214	431	444	462	470	562	3372	3758#											

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DISMAX	1766	451	460	520	574	2579	3009	3760#
DISMEM	15FF	3045	3069	3072#				
DISP0	080C	430	432#					
DISP1	081C	428	435	442#				
DISP2	0829	439	447	450#				
DISP3	082C	454#	565	577	580	588		
DISP4	0897	476	510#					
DISP5	0899	512#	528					
DISP6	08B5	526	531#					
DISP7	08B6	533#	542					
DISP8	08F3	576	582#					
DISPC	000C	54#	55	213	370	993	3001	3369
DISPG	0010	56#	1006	3002				
DISPLAY	07FD	319	426#					
DISPM	000E	55#	56	999				
DISREST	1635	3044	3052	3060	3087	3096	3099	3102#
DISSYM	1624	3081	3091	3093#				
DISTMP	196A	3762#						
DLOC	1A6C	3090	3111	3862#				
DMAF	001A	78#	2362					
DSTA0	1559	2974#	2985	2988				
DSTA1	1573	2983	2991#					
DSTA2	15B7	3020	3028#					
DSTATE	154E	1706	1852	2969#	3303	3334		
DSTRET	15B8	3005	3015	3026	3031#			
DTABLE	1975	846	3773#					
DVAL	0007	123#						
DWRITE	1256	1787	2344#					
ENDOP	18A6	3466	3469	3511	3524	3530	3559	3578#
EOF	001A	97#	1424					
ETRACE	0EC2	1663	1672#					
EX1	090E	607#						
EX2	091C	612	614#					
EX3	0927	617	619#					
EXAM0	0FDD	1851	1855#					
EXAM1	0FE3	1859#	1864					
EXAM2	0FF0	1860	1868#					
EXAM4	1041	1889	1920#					
EXAM5	1051	1921	1931#					
EXAMINE	0FCF	339	1848#					
EXECUTE	0907	320	602#					
EXPLIST	19FB	1221	1741	1747	1749	2185	2196	2217 2829 3846#
FALSE	0000	9#	10	11	12	589	1824	3759
FCB	005C	83#	85	239	244	250	254	610 615 1237 1391
		1402	1403	1731	1734	2003	2016	2133 2398
FCB2	006C	85#	1227					
FCBIN	1125	608	971	2115#				
FCBL	0020	84#	94	1229	1392	2265	3852	
FCR	0020	93#	1402					
FDN	0000	86#						
FFN	0001	87#	239					
FFNL	0008	88#	2256	2265				
FFT	0009	89#	2398					
FFTL	0003	90#	2261	2265				
FILDEL	10BD	2028#	2044	2052				
FILDELO	10C0	2032#						

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GOBRK2	1970	664	3344	3768#					
GOBRKS	196D	657	1705	3349	3766#				
GPO0	097D	681	684#						
GOP1	098F	680	687	690	696#				
GOP2	09D2	750#							
GOPR	096C	671#	1707	3232	3289	3304	3328	3335	3352
GOPR1	0973	669	678#						
GOTO	0947	322	652#						
HDIG0	0A58	855#	863						
HDIG1	0A65	861	865#						
HDIG2	0A7C	869	882#	894					
HDIG3	0A83	874	887#						
HDIG4	0A8F	880	885	892	896#				
HEXARI	0A0B	323	805#						
HEXCON	1380	1345	1353	2611#	2807				
HEXLISO	0AC2	929#	957						
HEXLIS1	0ADA	946#	952						
HEXLIS2	0AE6	948	953#						
HEXLIST	0ABD	807	924#						
HEXSYM	0A3B	810	834#						
HLDE	110C	465	521	575	1283	2084	2090#		
HLOC	1A74	228	759	3075	3080	3112	3127	3371	3527 3857#
HREAD	0C8E	1254	1293#	1297	1341				
HVAL	0008	124#							
IDS	0007	70#							
INOP	18A3	3455	3456	3460	3573#				
INFCB	0AEF	324	966#						
ISIS2	0000	11#	17	35	194	208	216	3212	
JMPOP	1826	3448	3450	3464#					
JNPTAB	076F	306	315#						
LASSM	0AFC	327	982#						
LASTEXP	19CC	2822	2847	3803#					
LCOM0	0C86	1261#	1285						
LCOM1	0C99	1272#	1277						
LF	000A	100#	2500	3785	3786	3786	3798		
LIFT	000C	73#							
LMSG	1990	1543	3786#						
LOADCH	0DAB	1454#	1468						
LOADSY	0D74	1422#	1427	1520					
LOADSY0	0D77	1423#	1448						
LOF	0005	68#							
LPERM0	0BBE	1126#	1145						
LPERM1	0BD1	1129	1141#						
LROTATE	103B	1903	1908	1913#	1918				
MAKE	126E	1768	2369#						
HLOAD	1983	219	1288	1548	2413	2424	3783#		
MODBAS	0000	29#	32	45	184	185	1377	2447	
MOVE	0B2B	328	1018#						
MOVE0	0B2E	1020#	1046						
MOVE1	0B47	1030	1034	1037#					
NBRK	17F3	2993	3288	3327	3425#				
NDI	107C	1948	1964#						
NEGCON	19EF	291	360	563	967	1065	1160	2524	2549 3094 3282
		3841#							
NEXTCON	1A02	2150	2306	2309	2643	2690	3847#		
NODIS	1116	363	1382	2103#					

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NODISK	11ED	2238	2248#																
NOTACC	15D2	3039	3047#																
NOTCALL	18F1	3620	3624	3631#															
NOTIDCR	1611	3071	3083#																
NOTMOV	15EF	3049	3063#																
NOWRPRM	0F38	1743	1753#																
NXTDIG	0A51	848#	899																
OKLOAD	0DA3	1440	1451#																
ONEFLG	0FCC	1798	1825	1836	1839#														
OPF	000F	74#	2326																
OPLIST	191E	3401	3685#	3696															
OPMAX	000D	3400	3698#																
OPN	1237	1240	1411	2319#															
PADDR	134C	471	486	820	830	942	1546	1549	1552	1556	1575								
		1588	1808	2522	2562#	2966													
PADDSH	1312	2515#	3370																
PADDSY	1313	140	839	1178	2518#	3025	3302												
PASSMSG	17AB	3298	3375#																
PBCNT	1974	732	3154	3416	3422	3770#													
PBELT	0004	61#	745	1112	1142	1181	3159	3175	3308										
PBLOC	1972	728	3419	3769#															
PBSIZE	0008	60#	700	1084	1125	1154	3159	3160	3243	3808									
PBTABLE	19CF	699	1083	1124	1153	3159	3242	3807#											
PBTRACE	19CE	204	3237	3269	3362	3393	3805#												
PBYTE	12EA	139	515	1172	1594	2486#	2564	2566	2961	3012	3030								
		3077	3297	3611															
PCBASE	0100	37#	48#	211	217	1247	1258	1286	1317										
PCHAR	12C4	138	282	473	843	876	884	916	919	921	951								
		1993	2457#	2473	2482	2484	2499	2501	2534	2541	2558								
		2572	2575	2945	2947	2952	2954	3074	3364	3609	3613								
PCOP	1872	3454	3526#																
PERM0	0889	1085#	1115																
PERM1	0BA7	1097	1100	1109#															
PERM2	0BA9	1088	1111#																
PERMBRK	0B51	331	1055#																
PERNZ0	0BE2	1155#	1184																
PERNZ1	0BF4	1162	1168#																
PERNZ2	0C07	1158	1166	1180#															
PERNZER	0BDD	1059	1151#																
PGRAPH	1354	572	584	2568#															
PLOC	1A76	215	683	717	757	1322	1530	1551	3000	3010	3033								
		3114	3130	3143	3210	3253	3300	3332	3365	3429	3548								
		3596	3856#																
PNIB	12DB	2478#	2492	2495															
PNIBH	12E5	2480	2483#																
POF	0004	67#																	
POSCOM	0758	294	298#																
PPERIOD	135E	2570	2573#																
PRDOTSY	1322	2530#	3100																
PRLABEL	1335	144	2547#	3333															
PRMSG	12D1	1409	1544	1806	1810	2469#	2475	3299											
PRSTAT	0DF0	1405	1425	1523#															
PRSTATO	0E06	1525	1541#	1716															
PRSYO	132B	2539#	2543																
PRSYM	132A	2537#	2556																
PSIZE	000C	57#	445	1005															

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PVAL	000A	126#	1856	2982					
QTYPE	1286	1251	1388	2396#					
R1	0C27	1203#	1207						
R2	0C31	1210#	1213						
RAMLOC	190F	3654	3661	3665#					
RBYTE	0D24	1303	1305	1307	1326	1329	1335	1358#	
RCOND	1896	3459	3561#						
RDC	1067	1951#	1973						
RDF	0014	76#	1264	1965					
RDHEX	0D0E	1343#	1364	1432					
RDHEX0	0D11	1345#	1430						
RDI	105F	1945#							
RDTYPE	0CF1	1313	1325#						
READ	0C13	333	1192#						
READ0	0C54	1230#	1235						
READN	0C49	262	621	1218	1223#				
RED1	0CF4	1329#	1333						
RELOC	FFFF	13#	20						
RESPBC	17E5	3183	3358	3415#					
RESPER0	1683	3161#	3178						
RESPER1	1690	3165	3173#						
RETCAT	18A8	3506	3566	3580#					
RETCAT1	18AA	3520	3583#						
RETCAT2	18DB	3588	3605	3615#					
RETCAT3	191B	3637	3667	3675#					
RETCAT4	191C	3629	3678#						
RETLOC	19F2	150	3227	3844#					
RETOP	182C	3452	3468#	3532					
RETUSER	18C3	3598	3601#						
RETUTL	0DFC	1528	1533#						
RIF	0003	66#							
RINIT	0C64	1240#							
RINX	1644	2918	3110#						
ROMRAM	18F8	3642#	3673						
RRET	1090	1958	1962	1977#					
RSLT	0FCD	1817	1820	1826	1829	1840#			
RST0	186A	3516	3521#						
RSTIN	00FF	108#	742	793	3145	3515			
RSTLOC	0038	107#	234	236					
RSTNUM	0007	103#	105#	107	108				
RSTOP	1860	3453	3513#						
RVECT	1639	1858	2972	3109#					
SCAN3	1159	631	1019	2154#					
SCANE0	119C	2193	2200#						
SCANE1	119F	2198	2202#						
SCANEX	1181	1625	2174	2184#					
SCANEXP	117E	141	355	382	656	806	990	1057	1216
		2155	2179#						1740
									1879
SCANRET	11C3	2189	2204	2210	2216#				
SCANWORD	116F	427	1569	1675	2168#				
SCSTORE	1493	2202	2207	2213	2820#				
SETASC	0E7F	1614#	1621						
SETBK	09E3	688	694	763#					
SETBK0	09FE	770	779	782	786#				
SETBYT0	0EA8	1631	1642#						
SETBYTE	0E58	1582	1591#						

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SETDMA	1262	2357#																		
SETGET	0E5C	1589	1595#																	
SETHEX	0E8E	1612	1624#																	
SETMO	0E3B	1573#	1617	1639	1651	1653														
SETM1	0EAF	1600	1648#																	
SETMEN	0E31	334	1568#																	
SETPC	0CEB	1318	1322#																	
SETPERO	0994	701#	748																	
SETPER1	09C2	715	720	723	735#															
SETPER2	09C9	705	733	743#																
SETPVAL	0B72	1066	1071#																	
SETPVAL0	0B7C	1070	1075	1077#																
SETTRO	0EDF	1685	1692#																	
SETTR1	0EEE	1696	1701#																	
SIMOP	1891	3462	3556#																	
SKLOAD	0D98	1444#	1449																	
SLOC	1A72	2794	3113	3493	3858#															
SOFTBRK	16D7	3208	3215	3222	3234#															
SPAGO	0B22	1003	1006#																	
SPAGE	0B20	991	995	1005#																
SPBASE	0100	38#	49#	221																
SSIZE	0032	59#	3854																	
STACK	1A78	222	272	751	2924	3110	3111	3112	3113	3114	3136									
		3855#	3856	3857	3858	3859	3860	3861	3862											
START	072C	241	271#	289	364	372	411	457	467	591	638									
		640	831	907	911	913	922	938	956	974	1008									
		1022	1036	1107	1139	1185	1538	1557	1606	1812	1853									
		1881	1911	1929	1938	1994	3373													
STOPO	179F	3368	3370#																	
STOPCR	1764	3321	3337#																	
STOPCRX	177C	3239	3319	3341	3354#															
STOPEX	177F	3357#	3614																	
SVAL	0009	125#																		
SYCHAR	13B1	2650#	2661																	
SYDEL	13C6	2652	2663#																	
SYDELIM	136E	2594#	2651																	
SYEND	0DC6	1458	1460	1470#																
SYLOC	13D9	2672	2677#																	
SYMDEF	10AE	258	618	2015#																
SYMSG	1986	1408	3785#																	
SYNXT	13E0	2655	2659	2665	2686#															
SYNXT0	13E9	2674	2692#																	
SYSEP	1371	2597#	2671	2750	2768	2815														
SYTOP	1981	187	926	1537	2108	2633	3712	3782#												
TAB	0009	98#	1457																	
TDISP	1968	463	566	3761#																
TFCB	1A36	1228	1390	3852#																
THODE	19A9	205	1673	3122	3379	3617	3790#													
TPAT	0680	130#																		
TRACO	0EEF	1679	1703#																	
TRACE	0EC0	335	1671#																	
TRACER	19AC	1703	3120	3384	3386	3792#														
TRANS	1218	2288#																		
TRAPAD	06A4	131	147#	183	275	1265	1967	2148	2328	2338	2350									
		2363	2375	2387	2463	2508														
TRAPJMP	06A9	152#	182	3217	3474	3477														

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TRUE	FFFF	10#	13	587	1799	1835
UNTRACE	0EBB	336	1661#			
USERBRK	19AA	231	1677	1700	3360	3585 3791#
VALUE	0EFC	337	1715#			
WBEGIN	19B0	1736	1748	1755	1771	3796#
WCLOSE	0F85	1801#				
WDISP	19F0	474	1580	1629	1649	2171 3618 3842#
WEND	19B2	1738	1750	1815	1818	3797#
WFLAG	0FAF	1774	1823#			
WFLAG1	0FC6	1831	1832	1834#		
WLOOP0	0F57	1773#	1800			
WLOOP1	0F5F	1778#	1784			
WORD0	085A	480#	494			
WORD1	0878	492	497#			
WORD2	0879	499#	507			
WRITE	0EFF	338	1725#			
WRTF	0015	77#	2349			
WRPCHK	10FD	636	2077#			
WRTMSG	19B4	1805	3798#			
WRTMSG1	19B7	1809	3799#			
WRTREC	19AE	1760	1791	1793	1807	3795#

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```

1      ; CP/M DEBUGGER DISASSEMBLER/ASSEMBLER MODULE
2      TITLE 'SYMBOLIC INTERACTIVE DEBUGGER (ASMOD) 12/16/77'
3      ;
4      ; COPYRIGHT (C) 1976, 1977
5      ; DIGITAL RESEARCH
6      ; BOX 579 PACIFIC GROVE, CA
7      ; 93950
8      ;
9      0000 = FALSE EQU 0 ;VALUE OF 'FALSE'
10     FFFF = TRUE EQU NOT FALSE ;VALUE OF 'TRUE'
11     0000 = ISIS2 EQU FALSE ;TRUE IF ASSEMBLING FOR 'IS'
12     0000 = DEBUG EQU FALSE ;TRUE IF CHECK-OUT TIME
13     FFFF = RELOC EQU TRUE ;TRUE IF GENERATING RELOC IMAGE
14     ;
15     IF DEBUG
16     ORG 1000H ;IN LOW MEMORY FOR DEBUG
17     ELSE
18     IF ISIS2
19     ORG 0E500H
20     ELSE
21     IF RELOC
22     0000 ORG 0000H ;READY FOR RELOCATION
23     ELSE
24     ORG 0D000H ;DEBUG IN 64K
25     ENDIF
26     ENDIF
27     ENDIF
28     ;
29     0005 = JLOC1 EQU 0005H ;BDOS JUMP LOCATION
30     ;
31     ;
32     ; ENTRY POINTS FOR DEBUGGING MONITOR
33     0680 = DEMON EQU $+680H
34     0683 = BEGIN EQU DEMON+03H ;BEGINNING OF DEBUGGING MONITOR
35     0689 = GETBUFF EQU DEMON+9H ;READ BUFFER
36     068C = GNC EQU DEMON+0CH
37     068F = PCHAR EQU DEMON+0FH ;PRINT CHARACTER IN REG A
38     0692 = PBYTE EQU DEMON+12H ;PRINT BYTE
39     0695 = PADDD EQU DEMON+15H ;PRINT ADDRESS IN REG D,E
40     0698 = SCANXP EQU DEMON+18H ;SCAN 0,1, OR 2 EXPRESSIONS
41     069E = BREAK EQU DEMON+1EH ;CHECK FOR BREAK AT CONSOLE
42     06A1 = PRLABEL EQU DEMON+21H ;PRINT SYMBOLIC LABEL
43     ;
44     ;
45     068C = CI EQU GNC ;SYNONYM FOR GNC
46     ;
47     000D = CR EQU 0DH
48     000A = LF EQU 0AH
49     0009 = TAB EQU 09H
50     ;
51     MODLOC: ;MODULE LOCATION
52     0000 C39306 JMP BEGIN ;ADDRESS FIELD IS ALTERED AT 'BEGIN'
53     0003 000000 DB 0,0,0 ;FILLER (USED IN SYMBOL TABLE)
54     0006 C34F03 JMP DISENT
55     0009 C32405 JMP ASMEN ;ENTRY POINT FOR ASSEMBLER
56     000C PC: DS 2 ;CURRENT FAKED PC DURING DISASSEMBLY

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57 000E      NPC: DS      2      ;MAX VALUE FOR PC (STOP ADDRESS)
58 0010      PAGM: DS      1      ;PAGE MODE IF NON ZERO
59 0011      TPC: DS      2      ;TEMPORARY PC FOR ASSEMBLER RESTORE ON ERROR
60 0013      OLDSP: DS     2      ;ENTRY SP VALUE
61           ;
62           ;
63           CO:      ;PRINT CHARACTER IN REGISTER C
64 0015 F5      PUSH     PSW
65 0016 79      MOV      A,C      ;PCHAR EXPECTS VALUE IN C
66 0017 CD8F06  CALL     PCHAR    ;TO PRINT THE CHARACTER
67 001A F1      POP      PSW
68 001B C9      RET
69           ;
70           ;
71           DELIM:   ;CHECK FOR DELIMITER
72 001C FE20      CPI      ' '
73 001E C8      RZ
74 001F FE09      CPI      TAB
75 0021 C8      RZ
76 0022 FE2C      CPI      ','
77 0024 C8      RZ
78 0025 FE0D      CPI      CR
79 0027 C8      RZ
80 0028 FE7F      CPI      7FH
81 002A CA2405    JZ      ASHEN   ;RESTART CURRENT LINE
82 002D C9      RET
83           ;
84           CRLF:   ;RETURN AND LINE FEED
85 002E 0E0D      MVI      C,CR
86 0030 CD1500    CALL     CD
87 0033 0E0A      MVI      C,LF
88 0035 CD1500    CALL     CD
89 0038 C9      RET
90           ;
91           SCAN:   ;FILL OPCODE WITH CHARACTERS
92           ;
93 0039 CD8C06    SC1:    CALL     CI
94           SCANO:  ;ENTER HERE IF CHARACTER SCANNED
95 003C FE0D      CPI      CR
96 003E CA1805    JZ      ERR
97 0041 CD1C00    CALL     DELIM
98 0044 CA3900    JZ      SC1
99           ;
100          ;
101          CLEAR BUFFER
102 0047 0E04      MVI      C,4
103 0049 217A06    LXI      H,OPCODE
104 004C 3620      SC0:    MVI      M,' '
105 004E 23      INX      H
106 004F 0D      DCR      C
107 0050 C24C00    JNZ      SC0
108          ;
109          ;
110          GARBAGE REMOVED AT BEGINNING OF SCAN
111 0053 0E05      MVI      C,5
112 0055 217A06    LXI      H,OPCODE
113 0058 77      SC2:    MOV      M,A      ;STORE CHARACTER
114 0059 CD8C06    CALL     CI

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113 005C CD1C00      CALL    DELIM
114 005F CA6A00      JZ      SC3
115 0062 23          INX      H
116 0063 0D          DCR      C
117 0064 CA1805      JZ      ERR      ;TOO LONG
118 0067 C35800      JMP      SC2
119                  ;
120                  SC3: ;END OF CURRENT SCAN, COMPARE FOR EMPTY
121 006A 3A7A06      LDA      OPCODE
122 006D FE20          CPI      ' '
123 006F C9          RET
124                  ;
125                  HEX: ;CONVERT ACCUMULATOR TO HEXADECIMAL
126 0070 D630          SUI      '0'
127 0072 FE0A          CPI      10
128 0074 D8          RC          ;'0' - '9'
129 0075 C6F9          ADI      (('0'-'A'+10) AND 0FFH)
130 0077 FE10          CPI      16
131 0079 D8          RC
132 007A C31805      JMP      ERR
133                  ;
134                  GADDR: ;GET ADDRESS VALUE TO B (HIGH ORDER) AND C (LOW) WITH COPY OF C IN A
135 007D CD9806      CALL    SCANEXP ;READ 1 EXPRESSION
136 0080 3D          DCR      A      ;GOES TO ZERO
137 0081 C21805      JNZ      ERR      ;? IF NOT A SINGLE EXPRESSION
138 0084 EB          XCHG      ;ADDRESS OF EXPRESSION TO HL
139 0085 4E          MOV      C,H      ;LOW BYTE
140 0086 23          INX      H
141 0087 46          MOV      B,H      ;HIGH BYTE
142 0088 79          MOV      A,C      ;COPY OF LOW BYTE TO A
143 0089 05          DCR      B
144 008A 04          INR      B      ;SETS ZERO FLAG IF B IS ZERO
145 008B C9          RET
146                  ;
147                  GBYTE: ;GET BYTE VALUE TO ACCUMULATOR AND C, CHECK FOR HIGH ORDER ZERO
148 008C CD7D00      CALL    GADDR
149 008F C21805      JNZ      ERR
150 0092 C9          RET
151                  ;
152                  ;
153                  ; *****
154                  ; ***** ASSEMBLER MODULE STARTS HERE *****
155                  ; *****
156                  ;
157                  ADJ: ;MOVE REGISTER INDICATOR TO MIDDLE FIELD OF CODE
158 0093 17          RAL
159 0094 17          RAL
160 0095 17          RAL
161 0096 E638          ANI      111000B
162 0098 C9          RET
163                  ;
164                  ADJ4: ;MOVE TO LEFT BY 4 AND MASK
165 0099 17          RAL
166 009A 17          RAL
167 009B 17          RAL
168 009C 17          RAL

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169 009D E630      MVI    110000B
170 009F C9        RET
171                ;
172                SEAR2: ;SAME AS SEAR, EXCEPT 2 CHARACTER MATCH
173                ;      H,L ADDRESS TABLE TO MATCH ON
174 00A0 EB          XCHG
175 00A1 2A7A06      LHLD    OPCODE ;2ND BYTE IN D, 1ST BYTE IN E
176 00A4 EB          XCHG          ;H,L ADDRESS TABLE
177 00A5 7B          SEAR0: MOV    A,E ;GET 1ST BYTE
178 00A6 BE          CMP     M      ;MATCH?
179 00A7 C2AF00      JNZ     SEAR1 ;TO ADDRESS NEXT ELT
180 00AA 23          INX     H      ;NEXT TO MATCH
181 00AB 7A          MOV     A,D    ;2ND CHAR
182 00AC BE          CMP     M
183 00AD C8          RZ            ;MATCH AT CURRENT ENTRY
184 00AE 2B          DCX     H
185 00AF 2B          SEAR1: DCX     H
186 00B0 2B          DCX     H      ;ADDRESSES NEXT ELEMENT
187 00B1 0D          DCR     C
188 00B2 C2A500      JNZ     SEAR0 ;FOR ANOTHER COMPARE
189                ;
190                ;      NO MATCH IN TABLE, RETURN WITH NON-ZERO VALUE
191 00B5 0D          DCR     C
192 00B6 C9        RET
193                ;
194                ;
195                SEAR: ;SEARCH FOR MATCH IN OPCODE TABLE, LENGTH OF TABLE IN REG-C
196                ;      D,E CONTAINS ADDRESS OF BINARY EQUIVALENT OF OPCODE
197                ;      H,L ADDRESS FOUR CHARACTER OPCODE TO MATCH
198                ;      OPCODE CONTAINS FOUR BYTE OPCODE TYPED AT CONSOLE
199                ;      RETURNS WITH ZERO VALUE IF OPCODE FOUND, WITH D,E
200                ;      ADDRESSING PROPER BYTE, NON-ZERO IF NOT FOUND.
201 00B7 0604      MVI     B,4    ;4 CHARACTER MATCH
202                ;
203 00B9 05          PUSH    D      ;SAVE THE CURRENT BYTE VALUE LOCATION
204 00BA 117A06      LXI     D,OPCODE ;ADDRESS CHARACTERS TYPED
205 00BD 1A          SE1: LDAX    D ;POINT TO FIRST BYTE TO MATCH
206 00BE BE          CMP     M      ;SAME CHARACTER AS TABLE?
207 00BF C2CA00      JNZ     SE2    ;NO, SKIP TO NXT TABLE ENTRY
208 00C2 23          INX     H      ;YES, LOOK AT NEXT CHARACTER
209 00C3 13          INX     D      ;MOVE TO NEXT CHARACTER TYPED
210 00C4 05          DCR     B      ;DECREMENT CHARACTER COUNT
211 00C5 C2BD00      JNZ     SE1    ;MORE TO MATCH?
212                ;
213                ;      COMPLETE MATCH, RETURN WITH D,E ADDRESSING BYTE VALUE
214 00C8 0D          POP     D
215 00C9 C9        RET
216                ;
217                ;      MISMATCH, FINISH COUNT
218 00CA 23          SE2: INX     H
219 00CB 05          DCR     B
220 00CC C2CA00      JNZ     SE2
221                ;
222                ;      H,L AT END OF FOUR BYTE AREA, MOVE BACK 8
223 00CF 11F8FF      LXI     D,-8
224 00D2 19          DAD     D      ;H,L READY FOR NXT MATCH

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25      ;
226 00D3 D1      POP      D      ;RESTORE BYTE POINTER
227 00D4 13      INX      D      ;MOVE TO NEXT IN CASE MATCH OK
228 00D5 0D      DCR      C      ;MORE OPCODES TO MATCH?
229 00D6 C2B700  JNZ      SEAR   ;LOOK FOR MORE
230      ;
231      ;      NO MATCH FOUND IN TABLE, SET NON-ZERO VALUE AND RETURN
232 00D9 0D      DCR      C
233 00DA C9      RET
234      ;
235      ;
236      GETREG:      ;SCAN FOR SIMPLE REGISTER REFERENCE
237 00DB C5      PUSH     B
238 00DC CD3900  CALL     SCAN
239 00DF CA1805  JZ       ERR
240 00E2 0E08  MVI      C,8      ;8 REGISTERS
241 00E4 216006  LXI      H,SREG  ;SIMPLE REGISTERS
242 00E7 CDA000  CALL     SEAR2   ;LOOK FOR 2 CHAR MATCH
243 00EA C21805  JNZ      ERR
244 00ED 0D      DCR      C
245 00EE 79      MOV      A,C
246 00EF C1      POP      B
247 00F0 C9      RET
248      ;
249      GETD:      ;GET DOUBLE PRECISION REGISTER
250 00F1 C5      PUSH     B
251 00F2 CD3900  CALL     SCAN
252 00F5 CA1805  JZ       ERR
253 00F8 0E05  MVI      C,5
254 00FA 217206  LXI      H,DREG
255 00FD CDB700  CALL     SEAR
256 0100 C21805  JNZ      ERR
257 0103 0D      DCR      C
258 0104 79      MOV      A,C
259 0105 C1      POP      B
260 0106 C9      RET
261      ;
262      GETDR:      ;GET DOUBLE REGISTER (BDHSP)
263 0107 CDF100  CALL     GETD
264 010A FE04  CPI      4      ;PSW?
265 010C CA1805  JZ       ERR
266 010F C9      RET
267      ;
268      GETPR:      ;GET PUSH/POP REGISTER (BDH OR PSW)
269 0110 CDF100  CALL     GETD
270 0113 FE03  CPI      3
271 0115 CA1805  JZ       ERR
272 0118 FE04  CPI      4
273 011A C0      RNZ
274 011B 3D      DCR      A      ;PSW MUST BE ADJUSTED
275 011C C9      RET
276      ;
277      GCON:      ;GET CONDITION CODE
278      ;      BUFFER IS SCANNED, MOVE LEFT BEFORE COMPARE
279 011D 217A06  LXI      H,OPCODE
280 0120 117B06  LXI      D,OPCODE+1

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281 0123 0E02      MVI    C,2      ;MOVE TWO CHARACTERS
282 0125 1A      MOP: LDAX    D      ;LOAD CHARACTER TO MOVE
283 0126 77      MOV     M,A      ;MOVE LEFT
284 0127 23      INX     H      ;NEXT DESTINATION
285 0128 13      INX     D      ;NEXT SOURCE
286 0129 0D      DCR     C
287 012A C22501    JNZ     MOP
288              ;
289              ;      MUST BE BLANK AT END
290 012D 1A      LDAX    D
291 012E FE20      CPI     ' '
292 0130 C21805    JNZ     ERR
293 0133 77      MOV     M,A
294              ;
295              ;      NOW READY TO DO THE COMPARE
296 0134 215006    LXI     H,CREG
297 0137 0E08      MVI     C,8
298 0139 CDA000    CALL    SEAR2
299 013C C21805    JNZ     ERR
300 013F 0D      DCR     C
301 0140 79      MOV     A,C
302 0141 CD9300    CALL    ADJ      ;MOVE TO BITS 3,4,5 OF BYTE (LSB = 0)
303 0144 C9      RET
304              ;
305              ;GCONA: ;GET CONDITION CODE TO REGISTER A, DOUBLE ADDRESS TO B,C
306 0145 CD1D01    CALL    GCON      ;CONDITION CODE TO A
307 014B F5      PUSH    PSW
308 0149 CD7D00    CALL    GADDR      ;VALUE TO B,C
309 014C F1      POP     PSW
310              ;      INCLUDE HIGH ORDER 11'S FOR J AND C OPCODES
311 014D F6C0      ORI     11000000B
312 014F C9      RET
313              ;
314              ;SETHD: ;SET MEMORY AT LOCATION PC TO VALUE ADDRESSED BY D
315 0150 1A      LDAX    D      ;VALUE TO ACCUM
316              ;
317              ;SETH: ;SET MEMORY AT LOCATION PC TO VALUE IN ACCUM, INC PC
318 0151 2A1100    LHLD    TPC
319 0154 77      MOV     M,A      ;STORE AT PC
320 0155 23      INX     H      ;PC=PC+1
321 0156 221100    SHLD    TPC
322 0159 C9      RET
323              ;
324              ;
325              ;
326              ;GETOP: ;PROCESS NEXT OPCODE
327 015A CD8C06    CALL    CI
328 015D FE0D      CPI     CR
329 015F CA4005    JZ      GOBACK ;RETURN IF SIMPLE INPUT
330 0162 FE2E      CPI     ' ' ;ALTERNATE RETURN IS .
331 0164 CA4005    JZ      GOBACK
332 0167 CD3C00    CALL    SCANO
333 016A CA1805    JZ      ERR
334              ;
335              ;CHK0: ;CHECK FOR OPCODES WITH NO OPERANDS
336 016D 0E11      MVI     C,17 ;LENGTH OF GROUP-0

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337 016F 21A605 LXI H,ETAB1 ;END OF GROUP-0
338 0172 114505 LXI D,TABLE ;FIRST BYTE VALUE
339 0175 CDB700 CALL SEAR ;LOOK FOR MATCH
340 0178 C27E01 JNZ CHK1 ;NO MATCH, CHECK FOR GROUP-1
341 ;
342 ; MATCHED OPCODE, D,E ADDRESS BYTE VALUE
343 017B C35001 JMP SETMD ;SET MEMORY AT PC AND INC PC
344 ;
345 ; CHECK GROUP-1 VALUES
346 017E 0E0A CHK1: MVI C,10 ;LENGTH OF GROUP-1
347 0180 21CE05 LXI H,ETAB2
348 0183 CDB700 CALL SEAR ;D,E REMAIN SET
349 0186 C29201 JNZ CHK2 ;NO MATCH, CHECK NEXT GROUP
350 ;
351 ; MATCH FOUND, SET BYTE AND GET BYTE OPERAND
352 0189 CD5001 CALL SETMD
353 018C CD8C00 CALL GBYTE ;GETS BYTE VALUE TO ACCUMULATOR
354 018F C35101 JMP SETM ;PUTS BYTE VALUE TO MEMORY AT PC
355 ;
356 ; CHECK GROUP-2 OPCODES, REQUIRE DOUBLE BYTE OPERAND
357 0192 0E06 CHK2: MVI C,6
358 0194 21E605 LXI H,ETAB3
359 0197 CDB700 CALL SEAR
360 019A C2AA01 JNZ CHK3 ;NO MATCH
361 ;
362 ; FOUND MATCH, GET OPCODE BIT PATTERN AND STORE
363 019D CD5001 CALL SETMD
364 01A0 CD7D00 OP2: ;ENTER HERE FOR DOUBLE BYTE OPERANDS
365 01A3 CD5101 CALL GADDR ;VALUE IN B,A
366 01A6 78 CALL SETM
367 01A7 C35101 MOV A,B
368 01A7 C35101 JMP SETM
369 ;
370 ; CHK3: ;CHECK FOR MOV INSTRUCTION
371 01AA 0E01 MVI C,1
372 01AC 21EA05 LXI H,PMOV
373 01AF CDB700 CALL SEAR
374 01B2 C2C601 JNZ CHK4
375 ;
376 ; MOV INSTRUCTION GET DESTINATION OPERAND
377 01B5 CDD800 CALL GETREG ;VALUE TO ACCUMULATOR
378 01B8 CD9300 CALL ADJ
379 01BB 47 MOV B,A ;SAVE IN B
380 01BC 0E40 MVI C,01000000B ;BIT PATTERN FOR MOV
381 ;
382 ; OP1: ;GET NEXT OPERAND FOR MOV, FIRST OPERAND FOR ACCUM/REG OPERATOR
383 01BE CDD800 CALL GETREG
384 01C1 B1 ORA C ;SETS HIGH ORDER TWO BITS
385 01C2 B0 ORA B ;SETS DESTINATION/OPERATOR
386 01C3 C35101 JMP SETM
387 ;
388 ; CHK4: ;CHECK FOR GROUP-5 (ACCUM/REG OPERATOR)
389 01C6 0E08 MVI C,8
390 01CB 210A06 LXI H,ETAB5
391 01CB CDB700 CALL SEAR
392 01CE C2DC01 JNZ CHK5

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393 ;
394 ; ACCUM/REG INSTRUCTION, C COUNTS OPERATORS AS SEARCH PROCEEDS
395 01D1 0D DCR C
396 01D2 79 MOV A,C
397 01D3 CD9300 CALL ADJ
398 01D6 47 MOV B,A
399 ; OPERATOR NUMBER (SHIFTED) SAVED FOR LATER MASK
400 01D7 0E80 MVI C,10000000B ;ACCUM/REG OPERATOR INDICATOR
401 01D9 C3BE01 JMP OP1 ;GETS OPERAND AND SAVES BYTE IN MEMORY
402 ;
403 CHK5: ;MAY BE INR/DCR
404 01DC 0E02 MVI C,2
405 01DE 211206 LXI H,PDCR
406 01E1 CDB700 CALL SEAR
407 01E4 C2F401 JNZ CHK6
408 ;
409 ; C=2 IF DCR, =1 IF INR
410 01E7 0C INR C ;+1
411 01E8 0C INR C ;+2
412 01E9 0C INR C ;+3
413 01EA CDD800 CALL GETREG ;VALUE TO ACCUM
414 01ED CD9300 CALL ADJ
415 01F0 B1 ORA C ;FILL PROPER INSTRUCTION INDICATOR
416 01F1 C35101 JMP SETM
417 ;
418 CHK6: ;MAY BE A MVI INSTRUCTION
419 01F4 0E01 MVI C,1
420 01F6 211606 LXI H,PMVI
421 01F9 CDB700 CALL SEAR
422 01FC C21002 JNZ CHK7
423 ;
424 ; MVI INSTRUCTION, GET REGISTER
425 01FF CDD800 CALL GETREG ;VALUE GOES TO ACCUMULATOR
426 0202 CD9300 CALL ADJ
427 0205 F606 ORI 110B
428 0207 CD5101 CALL SETM
429 020A CD8C00 CALL GBYTE
430 020D C35101 JMP SETM
431 ;
432 CHK7: ;CHECK FOR GROUP-7
433 0210 0E06 MVI C,6
434 0212 212E06 LXI H,ETAB7
435 0215 CDB700 CALL SEAR
436 0218 C23602 JNZ CHK8
437 ;
438 ; LXI,STAX,INX,DAD,LDA, OR DCX
439 021B 79 MOV A,C ;A=1...6
440 021C FE04 CPI 4
441 021E DA2302 JC INO
442 ;
443 ; MUST BE DAD,LDA, OR DCX
444 0221 C605 ADI 5 ;CHANGES ACCUM TO 9,10, OR 11
445 INO: ;ACCUMULATOR CONTAINS CODE, SAVE IT
446 0223 47 MOV B,A
447 0224 CD0701 CALL GETDR ;DOUBLE REGISTER VALUE TO ACCUM
448 0227 CD9900 CALL ADJ4 ;ADJUST VALUE TO MIDDLE FIELD

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449 022A B0      ORA    B      ;FILLS REMAINING BITS
450 022B C05101  CALL    SETM
451              ; MAY BE LXI
452 022E E6CF    ANI     11001111B
453 0230 FE01    CPI     1
454 0232 C0      RNZ     ;NOT LXI
455 0233 C3A001  JMP     OP2    ;PICK UP OPERAND
456              ;
457              ;
458              ;
459              CHK8: ;RST?
460 0236 0E01    MVI     C,1
461 0238 213206  LXI     H,PRST
462 023B CDB700  CALL    SEAR
463 023E C25102  JNZ     CHK9
464              ;
465              ; RST, GET OPERAND
466 0241 C08C00  CALL    GBYTE
467 0244 FE08    CPI     8
468 0246 D21805  JNC     ERR
469 0249 CD9300  CALL    ADJ
470 024C F6C7    ORI     11000111B
471 024E C35101  JMP     SETM
472              ;
473              CHK9: ;POP/PUSH?
474 0251 0E02    MVI     C,2
475 0253 213E06  LXI     H,PP0P+4
476 0256 CDB700  CALL    SEAR
477 0259 C27102  JNZ     CHK10
478              ;
479              ; C=2 IF PUSH, 1 IF POP
480 025C 0B      DCR     C
481 025D C26502  JNZ     PP0
482              ;
483              ; POP, SET BIT PATTERN
484 0260 0EC1    MVI     C,11000001B
485 0262 C36702  JMP     PP1
486              ;
487              PP0: ;PUSH
488 0265 0EC5    MVI     C,11000101B
489 0267 CD1001  PP1: CALL    GETPR  ;DOUBLE PUSH/POP REGISTER TO PROPER FIELD
490 026A CD9900  CALL    ADJ4    ;MOVE TO FIELD
491 026D B1      ORA     C
492 026E C35101  JMP     SETM
493              ;
494              CHK10: ;J/C/R?
495 0271 3A7A06  LDA     OP CODE
496 0274 FE4A    CPI     'J'
497 0276 C28102  JNZ     CHK11
498 0279 CD4501  CALL    GCONA
499              ; CONDITION CODE TO FIELD IN ACCUM, ADDRESS TO B,C
500 027C F602    ORI     010B
501 027E C38B02  JMP     FADDR  ;FILL ADDRESS
502              ;
503 0281 FE43    CHK11: CPI     'C'
504 0283 C29602  JNZ     CHK12

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505 0286 CD4501      CALL    GCONA
506 0289 F604        ORI     100B
507                  ;
508 028B CD5101      FADDR: CALL SETM
509 028E 79          MOV     A,C
510 028F CD5101      CALL    SETM
511 0292 78          MOV     A,B
512 0293 C35101      JMP     SETM
513                  ;
514 0296 FE52        CHK12: CPI    'R'
515 0298 C21805      JNZ     ERR
516 029B CD1D01      CALL    GCON
517 029E F6C0        ORI     11000000B
518 02A0 C35101      JMP     SETM
519                  ;
520                  ; *****
521                  ; ***** END OF ASSEMBLER MODULE, PART DISASSEMBLER *****
522                  ; *****
523                  ;
524 02A3 2A0E00      RDBYTE:  LHL    MPC
525 02A6 D5          PUSH    D      ;SAVE DE
526 02A7 EB          XCHG      ;MAX PC TO D,E
527 02A8 2A0C00      LHL    PC      ;CURRENT PC
528                  ; SUBTRACT PC FROM MPC, STOP IF CARRY GENERATED
529 02AB 7B          MOV     A,E
530 02AC 95          SUB     L
531 02AD 7A          MOV     A,D
532 02AE 9C          SBB     H
533 02AF D2B702      JNC     RD0
534                  ;
535                  ; PC EXCEEDS MPC, RETURN
536 02B2 2A1300      LHL    OLDSP
537 02B5 F9          SPHL      ;RESTORE ORIGINAL STACK POINTER
538 02B6 C9          RET
539                  ;
540 02B7 D1          RD0:  POP     D      ;RESTORE D,E
541 02B8 7E          MOV     A,M
542 02B9 23          INX     H
543 02BA 220C00      SHLD    PC
544 02BD C9          RET
545
546 02BE 3C          RGPRNT: INR     A
547 02BF E607        ANI     07
548 02C1 FE06        CPI     06
549 02C3 DAC802      JC      RGP1
550 02C6 C603        ADI     03
551 02C8 FE05        RGP1: CPI     05
552 02CA DACF02      JC      RGP2
553 02CD C602        ADI     02
554 02CF C641        RGP2: ADI     41H
555 02D1 4F          MOV     C,A
556 02D2 C31500      JMP     C0
557
558 02D5 47          DECODE: MOV     B,A
559 02D6 E6F0        ANI     0F0H
560 02D8 0F          RRC

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561 02D9 0F      RRC
562 02DA 0F      RRC
563 02DB 0F      RRC
564 02DC C690    ADI    90H
565 02DE 27      DAA
566 02DF CE40    ACI    40H
567 02E1 27      DAA
568 02E2 4F      MOV    C,A
569 02E3 CD1500  CALL    CO
570 02E6 78      MOV    A,B
571 02E7 E60F    ANI    0FH
572 02E9 C690    ADI    90H
573 02EB 27      DAA
574 02EC CE40    ACI    40H
575 02EE 27      DAA
576 02EF 4F      MOV    C,A
577 02F0 C31500  JMP     CO
578
579 02F3 0604    PRINT: MVI    B,4
580 02F5 4E      PI:   MOV    C,M
581 02F6 CD1500  CALL    CO
582 02F9 23      INX    H
583 02FA 05      DCR    B
584 02FB C2F502  JNZ     PI
585 02FE 0E20    MVI    C,' '
586 0300 C31500  JMP     CO

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587 ;
588 ; EXTRACT THE REGISTER FIELD FROM THE OPCODE
589 XTRACT: MOV    A,D
590 0303 7A      ANI    0011$1000B
591 0304 E638    RRC
592 0306 0F      RRC
593 0307 0F      RRC
594 0308 0F      RRC
595 0309 C9      RET
596 ;
597 ; PRINT CONDITION CODE
598 CCPRNT: CALL   XTRACT
599 030D 87      ADD    A
600 030E 4F      MOV    C,A
601 030F 214206  LXI    H,CCODE
602 0312 09      DAD    B
603 0313 4E      MOV    C,M
604 0314 CD1500  CALL    CO
605 0317 23      INX    H
606 0318 4E      MOV    C,M
607 0319 CD1500  CALL    CO
608 031C 0E20    MVI    C,' '
609 031E CD1500  CALL    CO
610 0321 C31500  JMP     CO
611 ;
612 ; PRINT REGISTER REFERENCE
613 RPPRNT: CALL   XTRACT
614 0324 CD0303  ANI    06
615 0327 E606    CPI    06
616 0329 FE06    JNZ    RPPRNT
617 032B C2BE02  MVI    C,'S'

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617 0330 CD1500      CALL    CO
618 0333 0E50        MVI     C,'P'
619 0335 C31500      JMP     CO
620                  ;
621                  ;
622                  PRPC:  ;PRINT CRLF FOLLOWED BY PC VALUE
623 0338 CD2E00      CALL    CRLF
624                  ;      (ENTER HERE FROM DISASSEMBLER)
625 033B 2A0C00      PRPC0: LHL    PC
626 033E 7C          MOV     A,H
627 033F CDD502      CALL    DECODE
628 0342 7D          MOV     A,L
629 0343 CDD502      CALL    DECODE
630 0346 0E20        MVI     C,' '
631 0348 CD1500      CALL    CO
632 034B CD1500      CALL    CO
633 034E C9          RET
634                  ;
635                  DISENT:  ;ENTER HERE FROM DEBUGGER
636 034F 210000      LXI     H,0
637 0352 39          DAD     SP
638 0353 221300      SHLD    OLDSP  ;SP SAVED FOR LATER RETURN
639                  ;
640                  ;      CHECK FOR PAGE MODE DISPLAY
641 0356 3A1000      LDA     PAGM  ;GET PAGE MODE (NUMBER OF LINES TO PRINT)
642 0359 B7          ORA     A      ;SET FLAGS
643 035A CA7103      JZ      DISASM ;NOT PAGE MODE
644                  ;
645                  ;      SET MPC TO 0FFFFH
646 035D 21FFFF      LXI     H,0FFFFH
647 0360 220E00      SHLD    MPC
648                  ;      255 IMPLIES TRACE MODE
649 0363 3C          INR     A
650 0364 C27103      JNZ     DISASM ;NOT TRACE MODE IF BR
651                  ;      TRACE MODE, SET TO 1 AND IGNORE ADDRESS FIELD
652 0367 3C          INR     A      ;1 IN ACC
653 0368 321000      STA     PAGM
654 036B 2A0C00      LHL    PC      ;RECOVER PC
655 036E C39703      JMP     DIS1
656                  ;
657                  ;
658                  DISASM:
659                  ;      CHECK FOR BREAK AT CONSOLE
660 0371 CD9E06      CALL    BREAK
661 0374 C24005      JNZ     GOBACK
662                  ;
663                  ;      CHECK TO SEE IF ENOUGH LINES PRINTED IN PAGE MODE
664 0377 211000      LXI     H,PAGM
665 037A 7E          MOV     A,M
666 037B B7          ORA     A      ;ZERO?
667 037C CA8303      JZ      DIS0  ;JMP IF NOT PAGE MODE
668                  ;
669                  ;      PAGE MODE, DECREMENT AND CHECK FOR ZERO
670 037F 35          DCR     M
671 0380 CA4005      JZ      GOBACK
672                  ;

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673 0383 2A0C00 DIS0: LHL D PC ;CURRENT PC
674 0386 CDA106 CALL PRLABEL ;OPTIONAL LABEL
675 0389 CD2E00 CALL CRLF ;NEW LINE
676 038C 0E20 MVI C, ' '
677 038E CD1500 CALL CD
678 0391 CD1500 CALL CD ;TWO LEADING BLANKS
679 0394 CD3B03 CALL PRPCO ;PRINT THE VALUE
680 0397 CDA302 DIS1: CALL RDBYTE
681 ; SAVE THE OPCODE IN THE D REGISTER
682 039A 57 MOV D,A
683 ; SEARCH THE FIRST 17 ITEMS FOR SIMPLE OPCODES
684 ; EI (FB) THROUGH NOP (00). NOTE THAT THE SEARCH PROCEEDS
685 ; THROUGH 'TABLE' STARTING AT THE BEGINNING, BUT THE OPCODES
686 ; ARE ACTUALLY STORED IN SYMBOLIC FORM IN REVERSE ORDER.
687 ;
688 039B 214505 LXI H, TABLE
689 039E 011100 LXI B, 17 ;FIRST 17 SIMPLE OPCODES
690 03A1 BE GROUP1: CMP M ;TABLE VALUE = OPCODE?
691 03A2 CAFD04 JZ TYPE1 ;SKIP TO PRINT IF SO
692 03A5 23 INX H ;MOVE TO THE NEXT TABLE ELEMENT
693 03A6 0D DCR C ;COUNT THE SIMPLE OPCODES DOWN
694 03A7 C2A103 JNZ GROUP1 ;TRY FOR ANOTHER
695 ;
696 ; NOT A SIMPLE OPERATION CODE, CHECK FOR IMMEDIATE OP
697 ; ADI, ACI, OUT, SUI, IN, SBI, ANI, XRI, ORI, CPI
698 03AA 0E0A MVI C, 10
699 03AC BE GROUP2: CMP M
700 03AD CAE904 JZ TYPE2
701 03B0 23 INX H
702 03B1 0D DCR C
703 03B2 C2AC03 JNZ GROUP2
704 ;
705 ; NOT AN IMMEDIATE OPERATION, CHECK FOR
706 ; SHLD LHL STA LDA JMP OR CALL
707 03B5 0E06 MVI C, 6
708 03B7 BE GROUP3: CMP M
709 03BB CACE04 JZ TYPE3
710 03BB 23 INX H
711 03BC 0D DCR C
712 03BD C2B703 JNZ GROUP3
713 ;
714 ; NOT TYPE3 OPERATION CODE, CHECK FOR MOV
715 ; BY MASKING THE HIGH ORDER TWO BITS -
716 ; XX00 0000 IS PRODUCED IN THE ACCUMULATOR
717 03C0 E6C0 ANI 0C0H
718 ; MOV IS GIVEN BY 01 DDD SSS (DDD IS DEST, SSS IS SOURCE)
719 03C2 FE40 CPI 40H
720 03C4 CAB404 JZ MOVOP
721 ;
722 ; NOT A MOV INSTRUCTION, CHECK FOR ACCUMULATOR-REGISTER OPS
723 ; BIT PATTERN 10 CCC RRR CORRESPONDS TO
724 ; ADD (0), ADC (1), SUB (2), SBB (3), ANA (4),
725 ; XRA (5), ORA (6), CMP (7)
726 03C7 FE80 CPI 80H
727 03C9 CAA504 JZ ACCREG
728 ;

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729      ; NOT ACCUM-REGISTER, RESTORE OPCODE FOR FURTHER CHECKS
730 03CC 7A      MOV     A,D
731      ;
732      ; LOOK FOR INR, DCR, AND MVI OPERATIONS
733      ; INR = 00 RRR 100, DCR = 00 RRR 101, MVI = 00 RRR 110
734      ; OR, INR = 00 RRR 4, DCR = 00 RRR 5, MVI = 00 RRR 6
735 03CD E6C7     ANI     1100*0111B
736 03CF D604     SUI     04
737      ; INR GOES TO ZERO
738 03D1 CA9604    JZ      INRREG
739      ; NOT INR, MAY BE DCR
740 03D4 3D       DCR     A
741 03D5 CA9004    JZ      DCRREG
742 03D8 3D       DCR     A
743      ; NOT DCR, MAY BE MVI
744 03D9 CA7C04    JZ      MVIREG
745      ; NOT INR, DCR, OR MVI INSTRUCTION
746      ;
747      ; RESTORE THE OPCODE
748 03DC 7A       MOV     A,D
749      ; LOOK FOR LXI STAX INX DAD LDAX DCX OPCODES
750      ; LXI = 00 RR 0001,
751      ; STAX= 00 RR 0010,
752      ; INX = 00 RR 0011,
753      ; DAD = 00 RR 1001,
754      ; LDAX= 00 RR 1010
755      ; DCX = 00 RR 1011
756 03DD E6C0     ANI     0C0H
757 03DF CA4A04    JZ      LXILST ;TO PROCESS FURTHER
758      ;
759      ; NOT ONE OF THE ABOVE, CHECK FURTHER
760      ; MUST BE OF THE FORM - 11 XXX XXX
761 03E2 7A       MOV     A,D
762 03E3 E607     ANI     0000*0111B ;TO EXTRACT THE RIGHTMOST BITS
763      ; RETURN CONDITIONALS TAKE THE FORM 11 XXX 000
764 03E5 CA3F04    JZ      RETCON ;RETURN CONDITIONALLY
765      ; JUMP CONDITIONALS TAKE THE FORM 11 XXX 010 = 2
766 03E8 D602     SUI     02
767 03EA CA3404    JZ      JMPCON
768      ; CALL CONDITIONALS TAKE THE FORM 11 XXX 100 = 4 - 2 = 2
769 03ED D602     SUI     02
770 03EF CA2904    JZ      CALLCON
771      ; RST'S TAKE THE FORM 11 XXX 111 = 7 - 4 = 3
772 03F2 D603     SUI     03
773 03F4 CA1A04    JZ      RSTOP
774      ;
775      ; NONE OF THE ABOVE, PUSHES AND POP'S REMAIN
776 03F7 7A       MOV     A,D ;RESTORE OPCODE
777      ; FIRST CAPTURE REMAINING OPCODES CB, D9, DD, ED, FD
778 03F8 E608     ANI     0000*1000B ;THIS BIT RESET FOR POP,PUSH
779 03FA C20B05    JNZ     N8080 ;NOT 8080 OPCODE IF SET
780 03FD 7A       MOV     A,D ;RESTORE IT
781      ; PUSH = 11 XX0 101 = 5, POP = 11 XX0 001 = 1
782 03FE E607     ANI     07
783      ; USE THE RESULTING VALUE TO INDEX TO REGISTER TABLE
784 0400 4F       MOV     C,A

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885 0401 3D          DCR    A      ;POP GOES TO 00
886 0402 213906      LXI     H,PPOP-1
887 0405 09          DAD     B
888 0406 CDF302      CALL    PRINT
889                ;      GET THE RELEVANT REGISTER
890 0409 CD0303      CALL    XTRACT
891                ;      CHECK FOR PSW OPERATION CODE
892 040C FE06          CPI     06
893 040E C29F04      JNZ     D6
894 0411 213606      LXI     H,PPSW
895 0414 CDF302      CALL    PRINT
896 0417 C37103      JMP     DISASM
897                ;
898                ;      PRINT RST XXX INSTRUCTION
899 041A 213206      RSTOP: LXI     H,PRST
900 041D CDF302      CALL    PRINT
901 0420 CD0303      CALL    XTRACT
902 0423 CDD502      CALL    DECODE
903 0426 C37103      JMP     DISASM
904                ;
905                ;      CALL CONDITIONAL 'C'
906      CALLCON:
907 0429 0E43          MVI     C,'C'
908 042B CD1500      CALL    CO
909 042E CD0A03      CALL    CCPRNT
910 0431 C3D904      JMP     PREXT ;TO PRINT THE ADDRESS
911                ;
912                ;      JUMP CONDITIONAL 'J'
913      JMPCON:
914 0434 0E4A          MVI     C,'J'
915 0436 CD1500      CALL    CO
916 0439 CD0A03      CALL    CCPRNT
917 043C C3D904      JMP     PREXT ;TO PRINT THE ADDRESS
918                ;
919                ;      RETURN CONDITIONAL 'R'
920      RETCON:
921 043F 0E52          MVI     C,'R'
922 0441 CD1500      CALL    CO
923 0444 CD0A03      CALL    CCPRNT
924 0447 C37103      JMP     DISASM
925                ;
926                ;
927                ;      PROCESS ONE OF LXI STAX INX DAD LDAX DCX
928 044A 211A06      LXILST: LXI     H,PLXI
929                ;      CAPTURE 08, 10, 18, 20, 28, 30, AND 38
930 044D 7A          MOV     A,D      ;GET OPCODE
931 044E E607          ANI     111B    ;RIGHTMOST BITS ZERO?
932 0450 CA0805      JZ      #8080    ;NOT 8080 IF SO
933                ;      RECALL OPCODE TO DETERMINE WHICH ONE
934 0453 7A          MOV     A,D
935                ;      FIND THE PARTICULAR OPCODE
936 0454 E60F          ANI     0FH
937                ;      LXI HAS LEAST SIGNIFICANT FOUR BITS = 0001
938 0456 3D          DCR     A
939 0457 CA6E04      JZ      LXIREG
940                ;      STAX 0010 BECOMES 0001 = 1

```

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```

; INX 0011 BECOMES 0010 = 2
; DAD 1001 BECOMES 1000 = 3
; LDAX 1010 BECOMES 1001 = 9
; DCX 1011 BECOMES 1010 = 10
CPI 03
JC D4
; MUST BE DAD, LDAX OR DCX
SUI 05
; DAD 8 BECOMES 3
; LDAX 9 BECOMES 4
; DCX 10 BECOMES 5
; ACCUMULATOR NORMALIZED
D4: ADD A
ADD A
; VALUE IN ACCUM MULTIPLIED BY FOUR
MOV C,A
DAD B
CALL PRINT
; STAX, INX, DAD, LDAX, OR DC X PRINTED, PRINT REGISTER
CALL RPPRNT
JMP DISASM

```

```

;
; PRINT REGISTER ADDRESSED BY HL (E.G., IN LXI)
LXIREG: CALL PRINT
CALL RPPRNT
MVI C,', '
CALL CO
JMP PREXT ;TO PRINT THE EXTENDED INSTRUCTION
;
;

```

```

;
;
; HVIREG: LXI H,PMVI
CALL PRINT
CALL XTRACT
CALL RGPRNT
MVI C,', '
CALL CO
JMP DATA8
;

```

```

; DCRREG: LXI H,PCR
JMP D5
;

```

```

; INRREG: LXI H,PINR
;

```

```

; PRINT THE INSTRUCTION GIVEN BY HL, FOLLOWED BY REGISTER
D5: CALL PRINT
CALL XTRACT
D6: CALL RGPRNT
JMP DISASM
;

```

```

; FOUND ACCUM REGISTER OPERATION - MIDDLE BITS GIVE PCODE
ACCREG: MOV A,D
ANI 3BH ;SELECT OPCODE BITS
RRC ;OPCODE * 4 FOR LENGTH FOUR STRING
MOV C,A
LXI H,PADD ;ADDRESS THE ACCUM-REGISTER LIST
DAD B

```

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```

897 04AE CDF302 CALL PRINT
898 04B1 C3C504 JMP D9
899 ;
900 ; MOV OPERATION FOUND
901 04B4 21EA05 MOVOP: LXI H,PMOV
902 04B7 CDF302 CALL PRINT
903 04BA CD0303 CALL XTRACT
904 04BD CDBE02 CALL RGPRNT
905 04C0 0E2C MVI C,', ' ;REGISTER DELIMITER
906 04C2 CD1500 CALL CO
907 04C5 7A D9: MOV A,D
908 04C6 E607 ANI 07
909 04CB CDBE02 CALL RGPRNT
910 04CB C37103 JMP DISASM
911 ;
912 ; TYPE GROUP3: CALL JMP LDA STA LHL SHLD
913 TYPE3:
914 04CE 79 MOV A,C ;*4 FOR LENGTH 4
915 04CF 87 ADD A
916 04D0 87 ADD A
917 04D1 4F MOV C,A
918 04D2 21CE05 LXI H,TAB3-4
919 04D5 09 DAD B
920 04D6 CDF302 CALL PRINT
921 ;
922 ; ARRIVE HERE TO PRINT THE ADDRESS FIELD
923 04D9 CDA302 PREXT: CALL RDBYTE ;LOW ADDRESS TO A
924 04DC F5 PUSH PSW ;SAVE IT
925 04DD CDA302 CALL RDBYTE
926 04E0 57 MOV D,A ;SET HIGH ADDRESS
927 04E1 F1 POP PSW ;RECALL LOW ADDRESS
928 04E2 5F MOV E,A ;DE IS THE ADDRESS TO PRINT
929 04E3 CD9506 CALL PADDX
930 04E6 C37103 JMP DISASM
931 ;
932 ; TYPE THE IMMEDIATE OPCODES (INCLUDING IN/OUT)
933 04E9 79 TYPE2: MOV A,C ;TYPE IMMEDIATE OPERATION CODE
934 04EA 87 ADD A ;*2
935 04EB 87 ADD A ;*4 FOR LENGTH FOUR CHAR STRING
936 04EC 4F MOV C,A ;BC = INDEX * 4 FOR OPCODE
937 04ED 21A605 LXI H,TAB2-4
938 04F0 09 DAD B
939 04F1 CDF302 CALL PRINT
940 ;
941 ; ARRIVE HERE TO PRINT THE IMMEDIATE VALUE
942 04F4 CDA302 DATAB: CALL RDBYTE
943 04F7 CD9206 CALL PRYTE ;BYTE VALUE PRINTED
944 04FA C37103 JMP DISASM
945 ;
946 ; FOUND OPCODE IN TABLE, POSITION GIVEN
947 ; BY COUNT IN BC (NOTE THAT C IS COUNTED DOWN, WHILE
948 ; INDEX WAS MOVING UP THE TABLE DURING THE SEARCH)
949 04FD 79 TYPE1: MOV A,C ;TYPE SIMPLE OPCODES FROM GROUP 1
950 04FE 87 ADD A ;POSITION * 2
951 04FF 87 ADD A ;POSITION * 4 (FOUR CHAR CODES)
952 0500 4F MOV C,A ;BC IS INDEX * 4 OF OPCODE

```

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```

953 0501 216205 LXI H,TAB1-4
954 0504 09 DAD B ;HL NOW HOLDS ADDRESS OF CODE TO PRINT
955 0505 CDF302 CALL PRINT
956 0508 C37103 JMP DISASM
957 ;
958 N8080: ;NOT AN 8080 OPERATION CODE
959 050B 217606 LXI H,DBOP
960 050E CDF302 CALL PRINT ;PRINT THE '??='
961 0511 7A MOV A,D ;GET THE OPCODE
962 0512 CD9206 CALL PBYTE ;AND PRINT IT
963 0515 C37103 JMP DISASM
964 ;
965 ERR: ;ENTER HERE FOR ERROR REPORTING
966 0518 CD2E00 CALL CRLF
967 051B 0E3F MVI C,'?'
968 051D CD1500 CALL CO
969 ;
970 0520 2A1300 LHLD OLDSP
971 0523 F9 SPHL
972 ; PC REMAINS UNCHANGED
973 ;
974 ;
975 ASMEN: ;ENTER HERE FROM DEBUGGER
976 0524 210000 LXI H,0
977 0527 39 DAD SP
978 0528 221300 SHLD OLDSP
979 ;
980 052B CD3803 ASMO: CALL PRPC ;PRINT PC VALUE
981 052E 221100 SHLD TPC ;SAVE PC VALUE
982 0531 CD8906 CALL GETBUFF ;FILL INPUT BUFFER
983 0534 CD5A01 CALL GETOP ;GET OPERATION
984 ; UPDATE PC, MUST BE CORRECT INPUT
985 0537 2A1100 LHLD TPC
986 053A 220C00 SHLD PC
987 053D C32B05 JMP ASMO
988 ;
989 0540 2A1300 GOBACK: LHLD OLDSP
990 0543 F9 SPHL
991 0544 C9 RET
992 ;
993 ; THE FIRST 17 ITEMS CORRESPOND TO SIMPLE OPCODES
994 ; (NOP BACKWARD THROUGH EI)
995 0545 00070F17 TABLE: DB 000H,007H,00FH,017H ;NOP RLC RRC RAL
996 0549 1F272F37 DB 01FH,027H,02FH,037H ;RAR DAA CMA STC
997 054D 3F76C9E3 DB 03FH,076H,0C9H,0E3H ;CMC HLT RET XTHL
998 0551 E9EBF3F9 DB 0E9H,0EBH,0F3H,0F9H ;PCHL XCHG DI SPHL
999 0555 FB DB 0FBH ;EI
1000 ;
1001 ; THE NEXT 10 ITEMS CORRESPOND TO THE IMMEDIATE OPCODES
1002 0556 C6CED3 DB 0C6H,0CEH,0D3H ;ADI ACI OUT
1003 0559 D6DBDEE6 DB 0D6H,0DBH,0DEH,0E6H ;SUI IN SBI ANI
1004 055D EEF6FE DB 0EEH,0F6H,0FEH ;XRI ORI
1005 ;
1006 0560 22 DB 022H ;SHLD
1007 0561 2A323AC3 DB 02AH,032H,03AH,0C3H
1008 0565 CD DB 0CDH

```

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```

1009 0566 4549202053TAB1: DB 'EI ','SPHL','DI ','XCHG'
1010
1011
1012
1013 0576 5043484C58 DB 'PCHL','XTHL','RET ','HLT '
1014
1015
1016 0586 434D432053 DB 'CMC ','STC ','CHA ','DAA '
1017
1018
1019 0596 5241522052 DB 'RAR ','RAL ','RRC ','RLC '
1020
1021
1022 05A6 4E4F5020 ETAB1: DB 'NOP '
1023 05AA 435049204FTAB2: DB 'CPI ','ORI ','XRI ','ANI '
1024
1025
1026 05BA 5342492049 DB 'SBI ','IN ','SUI ','OUT '
1027
1028
1029 05CA 41434920 DB 'ACI '
1030 05CE 41444920 ETAB2: DB 'ADI '
1031 ;
1032 05D2 43414C4C4ATAB3: DB 'CALL','JMP ','LDA ','STA '
1033
1034
1035 05E2 4C484C44 DB 'LHLD'
1036 05E6 53484C44 ETAB3: DB 'SHLD'
1037 ;
1038
1039 05EA 4D4F5620 PMOV: DB 'MOV '
1040 05EE 4144442041PADD: DB 'ADD ','ADC ','SUB ','SBB '
1041
1042
1043 05FE 414E412058 DB 'ANA ','XRA ','ORA '
1044 060A 434D5020 ETAB5: DB 'CMP '
1045
1046 060E 494E5220 PINR: DB 'INR '
1047 0612 44435220 PDCR: DB 'DCR '
1048 0616 4D564920 PMVI: DB 'MVI '
1049 061A 4C58492053PLXI: DB 'LXI ','STAX','INX ','DAD '
1050
1051
1052 062A 4C444158 DB 'LDAX'
1053 062E 44435820 ETAB7: DB 'DCX '
1054 ;
1055
1056 0632 52535420 PRST: DB 'RST '
1057 0636 50535720 PPSW: DB 'PSW '
1058 063A 504F502050PPOP: DB 'POP ','PUSH'
1059
1060 0642 4E5A5A204ECCODE: DB 'NZ','Z ','NC','C '
1061
1062 064A 504F504550 DB 'PO','PE','P '
1063 0650 4D20 CREG: DB 'H '
1064

```

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```
1065 0652 4220432044 DB 'B ','C ','D ','E '
1066 065A 48204C204D DB 'H ','L ','M '
1067 0660 4120 SREG: DB 'A '
1068 ;
1069 0662 4220202044 DB 'B ','D ','H ','SP '
1070 0672 50535720 DREG: DB 'PSW '
1071 ;
1072 0676 3F3F3D20 DBOP: DB '??= '
1073 067A OP CODE: DS 4
1074 067E END
```

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ACCREG	04A5	727	891#									
ADJ	0093	157#	302	378	397	414	426	469				
ADJ4	0099	164#	448	490								
ASMO	052B	980#	987									
ASMEN	0524	55	81	975#								
BEGIN	0683	34#	52									
BREAK	069E	41#	660									
CALLCON	0429	770	806#									
CCODE	0642	600	1060#									
CCPRNT	030A	597#	809	816	823							
CHK0	016D	335#										
CHK1	017E	340	346#									
CHK10	0271	477	494#									
CHK11	0281	497	503#									
CHK12	0296	504	514#									
CHK2	0192	349	357#									
CHK3	01AA	360	370#									
CHK4	01C6	374	388#									
CHK5	01DC	392	403#									
CHK6	01F4	407	418#									
CHK7	0210	422	432#									
CHK8	0236	436	459#									
CHK9	0251	463	473#									
CI	068C	45#	93	112	327							
CO	0015	63#	86	88	556	569	577	581	586	603	606	
		608	609	617	619	631	632	677	678	808	815	
		822	867	876	906	968						
CR	000D	47#	78	85	95	328						
CREG	0650	296	1063#									
CRLF	002E	84#	623	675	966							
D4	0461	846	853#									
D5	0499	880	885#									
D6	049F	793	887#									
D9	04C5	898	907#									
DATAB	04F4	877	942#									
DBOP	0676	959	1072#									
DCRREG	0490	741	879#									
DEBUG	0000	12#	15									
DECODE	02D5	558#	627	629	802							
DELIM	001C	71#	97	113								
DEMON	0680	33#	34	35	36	37	38	39	40	41	42	
DIS0	0383	667	673#									
DIS1	0397	655	680#									
DISASM	0371	643	650	658#	796	803	824	861	888	910	930	
		944	956	963								
DISENT	034F	54	635#									
DREG	0672	254	1070#									
ERR	0518	96	117	132	137	149	239	243	252	256	265	
		271	292	299	333	468	515	965#				
ETAB1	05A6	337	1022#									
ETAB2	05CE	347	1030#									
ETAB3	05E6	358	1036#									
ETAB5	060A	390	1044#									
ETAB7	062E	434	1053#									
FADDR	028B	501	508#									
FALSE	0000	9#	10	11	12							

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GADDR	007D	134#	148	308	365					
GBYTE	008C	147#	353	429	466					
GCON	011D	277#	306	516						
GCONA	0145	305#	498	505						
GETBUFF	0689	35#	982							
GETD	00F1	249#	263	269						
GETDR	0107	262#	447							
GETOP	015A	326#	983							
GETPR	0110	268#	489							
GETREG	00DB	236#	377	383	413	425				
GNC	068C	36#	45							
GOBACK	0540	329	331	661	671	989#				
GROUP1	03A1	690#	694							
GROUP2	03AC	699#	703							
GROUP3	03B7	708#	712							
HEX	0070	125#								
INO	0223	441	445#							
INRREG	0496	738	882#							
ISIS2	0000	11#	18							
JLOC1	0005	29#								
JMPCON	0434	767	813#							
LF	000A	48#	87							
LXILST	044A	757	828#							
LXIREG	046E	839	864#							
MODLOC	0000	51#								
MOP	0125	282#	287							
MOVOP	04B4	720	901#							
MPC	000E	57#	524	647						
MVIREG	047C	744	871#							
N8080	050B	779	832	958#						
OLDSP	0013	60#	536	638	970	978	989			
OP1	01BE	382#	401							
OP2	01A0	364#	455							
OPCODE	067A	102	110	121	175	204	279	280	495	1073#
P1	02F5	580#	584							
PADD	05EE	895	1040#							
PADDX	0695	39#	929							
PAGM	0010	58#	641	653	664					
PBYTE	0692	38#	943	962						
PC	000C	56#	527	543	625	654	673	986		
PCHAR	068F	37#	66							
PDCR	0612	405	879	1047#						
PINR	060E	882	1046#							
PLXI	061A	828	1049#							
PNOV	05EA	372	901	1039#						
PNVI	0616	420	871	1048#						
PPO	0265	481	487#							
PP1	0267	485	489#							
PPOP	063A	475	786	1058#						
PPSW	0636	794	1057#							
PREXT	04D9	810	817	868	923#					
PRINT	02F3	579#	788	795	800	858	864	872	885	897 902
		920	939	955	960					
PRLABEL	06A1	42#	674							
PRPC	0338	622#	980							
PRPC0	0338	625#	679							

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PRST	0632	461	799	1056#															
RDO	02B7	533	540#																
RDBYTE	02A3	524#	680	923	925	942													
RELOC	FFFF	13#	21																
RETCOM	043F	764	820#																
RGP1	02C8	549	551#																
RGP2	02CF	552	554#																
RGPRNT	02BE	546#	615	874	887	904	909												
RPPRNT	0324	612#	860	865															
RSTOP	041A	773	799#																
SCO	004C	103#	106																
SC1	0039	93#	98																
SC2	0058	111#	118																
SC3	006A	114	120#																
SCAN	0039	91#	238	251															
SCAN0	003C	94#	332																
SCANEXP	0698	40#	135																
SE1	00BD	205#	211																
SE2	00CA	207	218#	220															
SEA0	00A5	177#	188																
SEA1	00AF	179	185#																
SEAR	00B7	195#	229	255	339	348	359	373	391	406	421								
		435	462	476															
SEAR2	00A0	172#	242	298															
SETH	0151	317#	354	366	368	386	416	428	430	450	471								
		492	508	510	512	518													
SETHD	0150	314#	343	352	363														
SREG	0660	241	1067#																
TAB	0009	49#	74																
TAB1	0566	953	1009#																
TAB2	05AA	937	1023#																
TAB3	05D2	918	1032#																
TABLE	0545	338	688	995#															
TPC	0011	59#	318	321	981	985													
TRUE	FFFF	10#	13																
TYPE1	04FD	691	949#																
TYPE2	04E9	700	933#																
TYPE3	04CE	709	913#																
XTRACT	0303	589#	597	612	790	801	873	886	903										

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```

1 001E =      VERSION      EQU      30
2          ;      SID RELOCATOR PROGRAM, INCLUDED WITH THE MODULE TO PERFORM
3          ;      THE MOVE FROM 200H TO THE DESTINATION ADDRESS
4 0100          ORG      100H
5 0200 =      STACK EQU      200H
6 0005 =      BDOS EQU      0005H
7 0009 =      PRNT EQU      9      ;BDOS PRINT FUNCTION
8 0200 =      MODULE EQU      200H ;MODULE ADDRESS
9 0001 =      LXIM EQU      01H
10         ;
11 0100 01          DB      LXIM
12 0101          DS      2
13         ;      LXI      B,00      ;SET AT MERGE
14         ;
15 0103 C39901      JMP      START
16
17         ;      PATCH AREA, DATE, VERSION & SERIAL NOS.
18
19 0106 0000000000    DW      0,0,0,0,0,0,0,0
20 0116 0000000000    DW      0,0,0,0,0,0,0,0
21 0126 0000000000    DW      0,0,0,0,0,0,0,0
22 0136 0000000000    DW      0,0,0,0,0
23
24 0140 43502F4D20    DB      'CP/M Version 3.0'
25 0150 434F505952    DB      'COPYRIGHT 1982, '
26 0160 4449474954    DB      'DIGITAL RESEARCH'
27 0170 3135313238    DB      '151282'      ; VERSION DATE DAY-MONTH-YEAR
28 0176 00000000      DB      0,0,0,0      ; PATCH BIT MAP
29 017A 3635343332    DB      '654321'      ; SERIAL NO.
30
31 0180 43502F4D20SIGNON: DB      'CP/M 3 SID - Version '
32 0195 332E          DB      VERSION/10+'0','.'
33 0197 3024          DB      VERSION MOD 10 + '0','$'
34 0199 310002      START: LXI      SP,STACK
35 019C C5          PUSH      B
36 019D C5          PUSH      B
37 019E 118001      LXI      D,SIGNON
38 01A1 0E09      MVI      C,PRNT
39 01A3 CD0500      CALL     BDOS
40 01A6 C1          POP      B      ;RECOVER LENGTH OF MOVE
41 01A7 210700      LXI      H,BDOS+2;ADDRESS FIELD OF JUMP TO BDOS (TOP MEMORY)
42 01AA 7E          MOV      A,H      ;A HAS HIGH ORDER ADDRESS OF MEMORY TOP
43 01AB 3D          DCR      A      ;PAGE DIRECTLY BELOW BDOS
44 01AC 90          SUB      B      ;A HAS HIGH ORDER ADDRESS OF RELOC AREA
45 01AD 57          MOV      D,A
46 01AE 1E00      MVI      E,0      ;D,E ADDRESSES BASE OF RELOC AREA
47 01B0 D5          PUSH     D      ;SAVE FOR RELOCATION BELOW
48         ;
49 01B1 210002      LXI      H,MODULE;READY FOR THE MOVE
50 01B4 78      MOVE: MOV      A,B      ;BC=0?
51 01B5 B1          ORA      C
52 01B6 CAC101      JZ      RELOC
53 01B9 0B          DCX      B      ;COUNT MODULE SIZE DOWN TO ZERO
54 01BA 7E          MOV      A,H      ;GET NEXT ABSOLUTE LOCATION
55 01BB 12          STAX     D      ;PLACE IT INTO THE RELOC AREA
56 01BC 13          INX      D

```

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```

57 01B0 23      INX   H
58 01B8 C3B401  JMP   MOVE
59              ;
60              RELOC: ;STORAGE MOVED, READY FOR RELOCATION
61              ;
62 01C1 D1      POP   D      ;RECALL BASE OF RELOCATION AREA
63 01C2 C1      POP   B      ;RECALL MODULE LENGTH
64 01C3 E5      PUSH  H      ;SAVE BIT MAP BASE IN STACK
65 01C4 62      MOV   H,D    ;RELOCATION BIAS IS IN D
66              ;
67 01C5 78      RELO: MOV   A,B      ;BC=0?
68 01C6 B1      ORA   C
69 01C7 CAE301  JZ     ENDREL
70              ;
71              ;
72 01CA 0B      DCX   B      ;COUNT LENGTH DOWN
73 01CB 7B      MOV   A,E
74 01CC E607    ANI   111B    ;0 CAUSES FETCH OF NEXT BYTE
75 01CE C2D601  JNZ   REL1
76              ;
77 01D1 E3      XTHL
78 01D2 7E      MOV   A,M      ;NEXT 8 BITS OF MAP
79 01D3 23      INX   H
80 01D4 E3      XTHL          ;BASE ADDRESS GOES BACK TO STACK
81 01D5 6F      MOV   L,A      ;L HOLDS THE MAP AS WE PROCESS 8 LOCATIONS
82 01D6 7D      REL1: MOV   A,L
83 01D7 17      RAL          ;CY SET TO 1 IF RELOCATION NECESSARY
84 01D8 6F      MOV   L,A      ;BACK TO L FOR NEXT TIME AROUND
85 01D9 D2DF01  JNC   REL2    ;SKIP RELOCATION IF CY=0
86              ;
87              ;
88 01DC 1A      LDAX  D
89 01DD 84      ADD   H      ;APPLY BIAS IN H
90 01DE 12      STAX  D
91 01DF 13      REL2: INX   D      ;TO NEXT ADDRESS
92 01E0 C3C501  JMP   RELO    ;FOR ANOTHER BYTE TO RELOCATE
93              ;
94              ENDREL:      ;END OF RELOCATION
95 01E3 D1      POP   D      ;CLEAR STACKED ADDRESS
96 01E4 2E00    MVI   L,0
97 01E6 E9      PCHL          ;GO TO RELOCATED PROGRAM
98 01E7      END

```

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BDO5	0005	6#	39	41
ENDREL	01E3	69	94#	
LXIM	0001	9#	11	
MODULE	0200	8#	49	
MOVE	01B4	50#	58	
PRNT	0009	7#	38	
RELO	01C5	67#	92	
REL1	01D6	75	82#	
REL2	01DF	85	91#	
RELOC	01C1	52	60#	
SIGNON	0180	31#	37	
STACK	0200	5#	34	
START	0199	15	34#	
VERSION	001E	1#	32	33

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